Chapter 2: Mortality

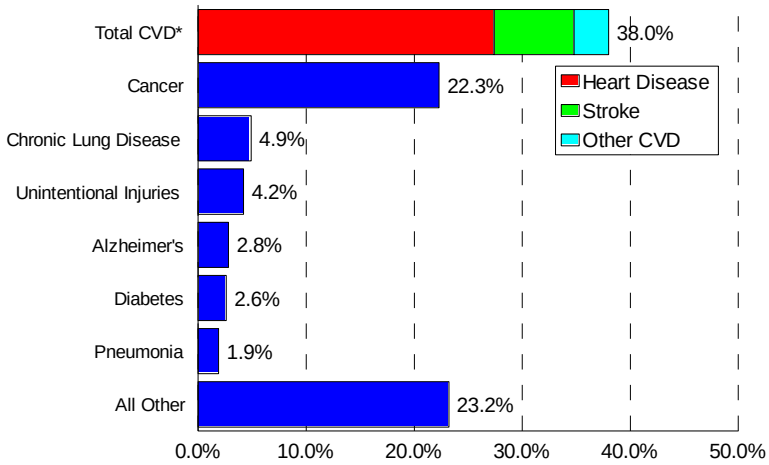
Introduction

Cardiovascular disease (CVD) mortality rates are declining nationally. However, the prevalence of many risk factors associated with CVD remain stable or are worsening[1,2]. Most striking is the recent increase in obesity among U.S. residents of all ages[3,4]. In addition, physical activity levels are low and type-2 diabetes is increasing[5,6]. These contradictory findings indicate that recent declines in CVD mortality likely resulted from improvements in case fatality, rather than declines in CVD incidence and prevalence[7,8]. As a result, the economic impact of CVD is likely worsening (from increases in treatment intervention) despite improvements in mortality.

Within this chapter, an overview of Nebraska mortality for total CVD as well as specific CVDs is presented. This chapter contains four sub-sections, including overall CVD, heart disease, stroke, and high blood pressure mortality. In addition, information on heart disease and stroke risk factors is presented. This chapter provides information supporting the elimination of disparities and economic improvement through identifying high-risk populations (in greatest need of intervention).

Cardiovascular disease (CVD) continues to be the leading cause of death in Nebraska among both genders and all racial and ethnic groups (excluding Asians). CVD was directly responsible for approximately 2 in every 5 Nebraska deaths in 2001 and was listed as the primary (or underlying) cause of death on 5,763 death certificates (Figure 1).

Figure 1: Leading Causes of Death in Nebraska, 2001



*Includes Heart Disease, Stroke, and other CVD related deaths (ICD-10 Codes I00-I99)
Source: Nebraska Vital Records

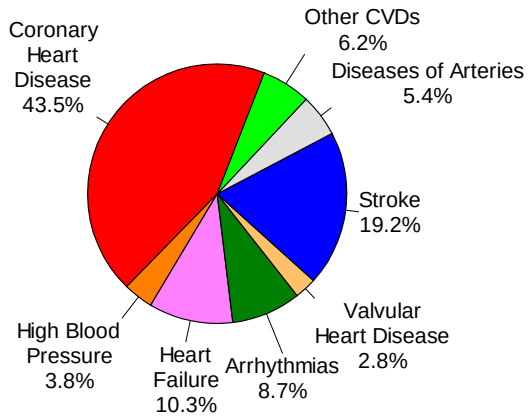
In addition to directly causing death, CVD contributes indirectly to a large number of deaths resulting from other conditions. In 2001, CVD was listed as a contributing factor in 3,516 deaths. This indicates CVD caused or contributed to 3 in every 5 Nebraska deaths (61.2%) in 2001. Of the 3,516 deaths in which CVD was a contributing factor, 1,065 (30.2%) were listed as a contributing factor to a death in which cancer was the primary cause. This indicates that CVD contributed to nearly 1 in every 3 cancer deaths (31.4%) in 2001.

Note: mortality data are classified through the use of the international classification of disease (ICD) codes. These codes, which are published by the World Health Organization (WHO), are updated every twenty years, and recently underwent the tenth revision (ICD-10) which was implemented in 1999. As a result, to compare data from 1979-1998 (ICD-9 data) to data from 1999-2001 (ICD-10), ICD-10 comparability ratios must be applied to data from years 1979-1998. Aside from total CVD mortality data, all data (unless noted), prior to 1999, presented in this chapter have been modified to allow for comparability with data from 1999 and beyond. *Please see Methodology Section for further detail*

More Nebraska residents in 2001 died from CVD than from the next five leading causes of death combined. In particular, Nebraska residents in 2001 were 1.6 times more likely to die of CVD than cancer (the second leading cause of death) and 7.5 times more likely to die of CVD than chronic lung disease (the third leading cause of death).

Collectively, many diseases combine to form CVD (Figure 2). Of those diseases, coronary heart disease (CHD) accounted for the largest percentage (43.5%) of all CVD deaths between 1999 and 2001. CHD was followed by stroke and heart failure.

Figure 2: Types of CVD* Death in Nebraska
Percentage Breakdown, 1999-2001



*Includes ICD-10 codes I00-I99; codes for specific cardiovascular diseases can be found in the methodology section of this report.
Source: Nebraska Vital Records

Differences by gender exist in the percentage who die from various types of CVD. In particular, nearly half (49.0%) of male CVD deaths resulted from CHD compared to 39.1 percent among females. In contrast, a larger percentage of females than males died from heart failure and stroke.

There is a tremendous amount of premature life lost to CVD in Nebraska. In 2001, the average age for a CVD death was 80.3 years old. Although CVD mortality occurs most often within older adult populations, CVD does claim a large number of deaths prematurely. One method for measuring premature mortality is through examining the years of life lost prior to age 75, also called years of productive life lost (or YPLL) (*see Methodology Section for further details on YPLL*). In 2001, Nebraska lost 20,365 years of productive life to CVD (second only to cancer). This indicates that, on average, each victim of CVD lost 3.4 years of productive life. Table 1 provides detail on YPLL among some of the leading causes of death in Nebraska.

Similar to the nation, Nebraska has established a set of health goals and objectives for the year 2010[9]. Of the cardiovascular diseases, objectives are established for coronary heart disease and stroke (Table 2). Based on 1999-2001 data, progress is needed if the objectives are to be achieved by 2010. From the time of this report, there are only five years to successfully achieve the objectives. Among racial and ethnic minority residents, large declines are necessary if the objectives are going to be reached. It should be noted that objectives for Asian Americans and Hispanic Americans are lower than those for other races. In addition, Asian residents have a small number of deaths per year, thus, their rates and objectives should be viewed with caution.

Within Nebraska there are a variety of sub-populations that suffer from disproportionately high rates of mortality from CVD. Aside from the older adult population, African Americans, Native Americans, and Medicaid enrollees appear to be among the sub-populations that are at greatest risk for CVD mortality. Throughout this chapter, detailed information on these sub-populations and others is presented.

There are a wide variety of risk factors that contribute to CVD. Each of these risk factors can be categorized as preventable (those over which the individual or society has some control) or non-preventable (those over which the individual has no control). The influence of preventable risk factors on CVD differs by disease. As a result, information on preventable risk factors within this chapter is presented for heart disease and stroke within their respective chapter sub-sections.

Table 1: Ranking Years of Productive Life Lost (below age 75) in Nebraska Among Leading Causes of Death, 1999-2001

Rank	Cause of Death	Total Deaths	Total YPLL	Average YPLL Per Death
1	Cancer	10,178	70,573	6.9
2	CVD	17,632	59,799	3.4
3	Unintentional Injuries	1,932	45,938	23.8
4	Suicide	557	18,073	32.4
5	Birth Defects	215	11,822	55.0
6	Homicide	169	7,453	44.1
7	Diabetes	1,182	7,067	6.0
8	Chronic Lung Disease	2,270	6,241	2.7
9	Pneumonia	1112	3,293	3.0
10	Alzheimer's Disease	1,115	654	0.6

Note: See methodology section for cause of death codes
Source: Nebraska Vital Records

Table 2: Progress Toward NE HP2010 CVD Mortality Objectives

Cause of Death	Race/Ethnicity	Years	NE Rate* 1999-2001	NE 2010 Objective	% Reduction Necessary to achieve HP2010 Goals
Coronary Heart Disease	Total	1999-2001	133.2	121.5	-8.8%
	White	1999-2001	133.2	121.5	-8.8%
	African American	1999-2001	146.1	121.5	-16.8%
	Native American	1999-2001	256.3	121.5	-52.6%
	Asian American	1999-2001	107.0	26.0	-75.7%
	Hispanic American	1999-2001	69.4	69.6	None
Stroke	Total	1999-2001	57.9	47.4	-18.1%
	White	1999-2001	56.9	47.4	-16.7%
	African American	1999-2001	84.5	47.4	-43.9%
	Native American	1999-2001	54.0	47.4	-12.2%
	Asian American	1999-2001	61.6	32.7	-46.9%
	Hispanic American	1999-2001	29.7	22.3	-24.9%

*Age-adjusted rate per 100,000 population
Codes: Coronary Heath Disease=ICD-10 codes I20-I25; Stroke=ICD-10 codes I60-I69
Data Sources:
1. Nebraska Health and Human Services System, Department of Services, Preventive and Community Health, Office of Public Health; Department of Finance and Support, Financial Services Division. Nebraska 2010 Health Goals and Objectives. May 2002.
2. Nebraska Vital Records

Total Cardiovascular Disease (CVD) Mortality

Definition: CVD includes all diseases of the heart and blood vessel, which include coronary heart disease, stroke, congestive heart failure, hypertensive disease, and atherosclerosis. CVD is also commonly referred to as "diseases of the circulatory system."

Codes used to define CVD: ICD-10 codes I00-I99; ICD-9 codes 390-459

Total CVD Mortality Highlights

National Highlights

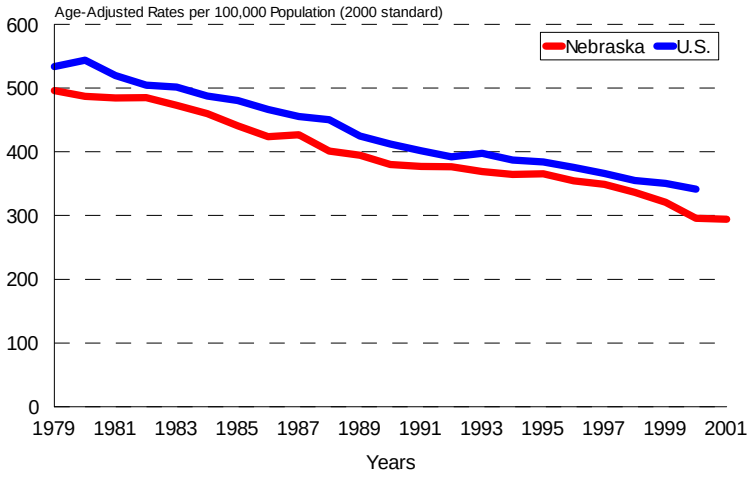
- The leading cause of death every year since 1900 (except 1918)[2].
- Killed 931,108 residents in 2000[2].
- Accounted for 1 in every 2.6 deaths in 2000[2].
- Kills nearly 2,600 Americans each day, for an average of 1 death every 34 seconds[2].

Nebraska Highlights

- CVD is the leading cause of death.
- Killed 5,763 Nebraska residents in 2001; accounting for nearly 2 in every 5 deaths (38.0%).
- Killed more residents in 2001 than the next five leading causes of death combined.
- Caused or contributed to 3 in every 5 (61.2%) deaths in 2001.
- The mortality rate (age-adjusted) for CVD declined 40.7 percent between 1979 and 2001.
- Older adults, males, African Americans, and Native American are at particularly high risk for CVD mortality.
- In 2001, residents enrolled in Medicaid at their time of death were 3.5 times more likely than residents not enrolled in Medicaid at their time of death to die from CVD (based on their age-adjusted mortality rate).

Overall CVD mortality in both Nebraska and the U.S. has been steadily declining since the late 1970s (Figure 3). Specifically, between 1979 and 2001, Nebraska's age-adjusted CVD mortality rate declined 40.7 percent. In addition, Nebraska residents are less likely than U.S. residents to die of CVD. In 2000, U.S. residents were 15 percent more likely than Nebraska residents to die from CVD[10]. Compared to 50 U.S. states and the District of Columbia, Nebraska's age-adjusted CVD mortality rate ranked 13th lowest in 2000 (interquartile rate range 296.3-373.1)[10].

Figure 3: CVD Mortality Trends*, 1979-2001

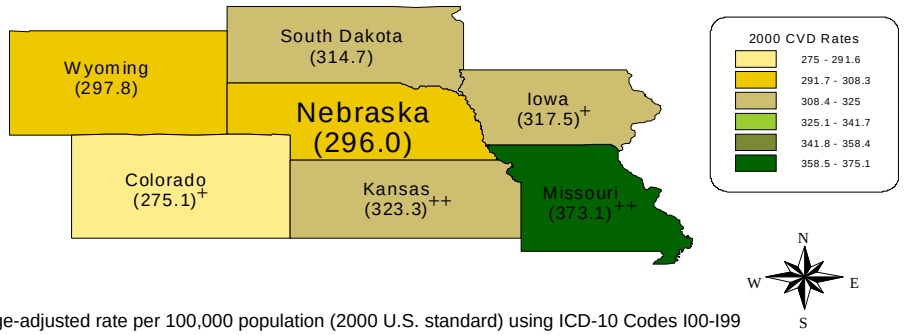


*Includes ICD-9 Codes 390-459 and ICD-10 Codes I00-I99
Sources: Nebraska Vital Records; CDC Wonder, Mortality Data, <http://wonder.cdc.gov>

Similar to the mortality rate, the actual number of CVD deaths is also declining in Nebraska. Between 1979 and 2001, the number of actual CVD deaths declined from 7,568 to 5,763 respectively. This indicates that, between 1979 and 2001, CVD mortality declined by an average of 82 deaths per year, for a 23.9 percent overall decline. In contrast, the number of CVD deaths in the U.S. declined only 2.2 percent between 1979 and 2000[10]. Even though the rates for CVD mortality are declining dramatically, the less dramatic decline in the number of CVD deaths and high CVD prevalence (as presented in Chapter 1) indicate that the impact due to CVD on the health care system is likely not improving.

Nebraska compares well to its bordering states. In 2000, Colorado residents were less likely than Nebraska residents to die from CVD while residents of Kansas, Iowa and Missouri were more likely than Nebraska residents to die from CVD (based on age-adjusted mortality rates) (Map 1)[1,10]. While CVD mortality rates for Nebraska are lower than many bordering states, the large number of premature deaths and enormous medical expenses still warrant significant attention. As a result, it is important that Nebraska take advantage of the CVD prevention and control opportunities that it has been given, as well as continues to create and implement new and aggressive plans for addressing CVD in future years.

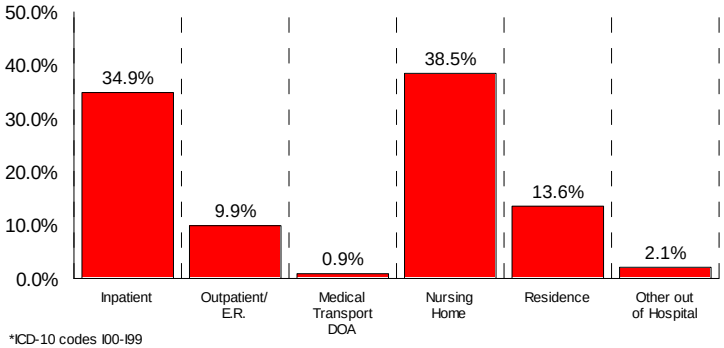
Map 1: Death Rates for Cardiovascular Disease* in 2000 for Nebraska and Bordering States



*Age-adjusted rate per 100,000 population (2000 U.S. standard) using ICD-10 Codes I00-I99
+,++ Rate is significantly different from the Nebraska rate at the .01 or .001 levels respectively
Sources: Nebraska Vital Records; CDC Wonder, Mortality Data, <http://www.wonder.cdc.gov/>

Unfortunately, many CVD deaths in Nebraska occur without medical care (Figure 4). Between 1999 and 2001, nearly 2 in every 3 CVD deaths (65.0%) occurred outside of inpatient hospital care, likely resulting from sudden or near sudden death. There is a variety of effective life saving CVD interventions available, however, the limited window of administration for many of these interventions supports the need for victims to recognize their signs, have quality emergency medical services available, and that health professionals properly diagnose and treat the condition(s).

Figure 4: Location of CVD Death in Nebraska*, 1999-2001



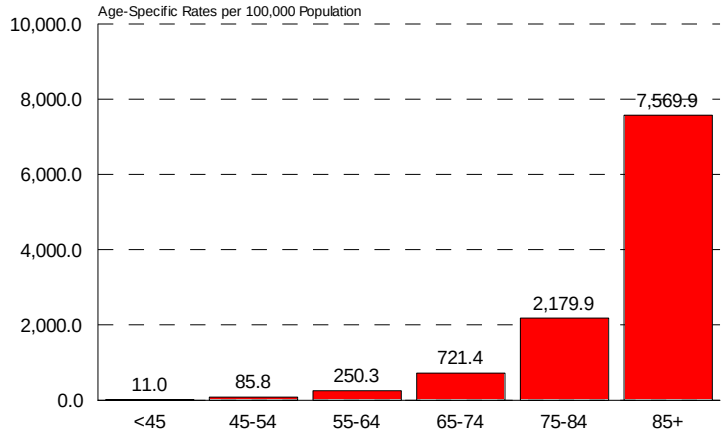
*ICD-10 codes I00-I99
Note: 16 deaths occurred in an unknow n location
Source: Nebraska Vital Records

Total CVD Mortality by Age

Age is undoubtedly the greatest predictor of cardiovascular disease (CVD) mortality. The vast majority of CVD deaths occur among older adults in Nebraska. Between 1999 and 2001, 3 in every 4 CVD deaths occurred among Nebraska residents aged 75 and older. Rates of death from CVD increase dramatically as age increases, even among the older adult population (aged 65 and older) (Figure 5). In particular, adults aged 85 and older were 3.5 times more likely to die of CVD than adults aged 75-84 and 10.5 times more likely to die of CVD than adults aged 65-74.

While risk for CVD death is highest among the older adult population, CVD does claim a large number of deaths among those under the age of 65. Between 1999 and 2001, 2,006 Nebraska residents died from CVD prior to reaching the age of 65. CVD claimed greater than 1 in every 10 deaths (11.7%) among Nebraska residents under the age of 45 and greater than 1 in every 4 deaths (27.8%) among those aged 45-64 years between 1999 and 2001. Among Nebraska residents aged 45-64 years, only cancer claimed more lives than CVD between 1999 and 2001.

Figure 5: Nebraska CVD Mortality Rates* by Age: 1999-2001



*Includes ICD-10 Codes I00-I99
Source: Nebraska Vital Records

The CVD death rate among Nebraska residents under 45 years of age remained stable between 1979 and 2001 (Table 3). In contrast, CVD death rates from 1979-1983 to 1999-2001 declined sharply among both middle aged and older adults; 54.7 percent and 28.2 percent declines respectively.

Table 3: Trends in CVD Mortality* by Age in Nebraska

	<45		45-64		65+	
years	Average # deaths/year	rate**	Average # deaths/year	rate**	Average # deaths/year	rate**
1979-1983	117	11.0	954	326.3	6,517	3,141.5
1984-1988	109	10.2	802	278.7	6,240	2,885.8
1989-1993	114	10.6	659	226.6	5,916	2,636.1
1994-1998	128	11.7	632	192.7	5,841	2,552.1
1999-2001	121	11.0	547	147.8	5,209	2,255.0
% change: 79-8" to 99-01	3.4%	0.4%	-42.6%	-54.7%^	-20.1%	-28.2%^

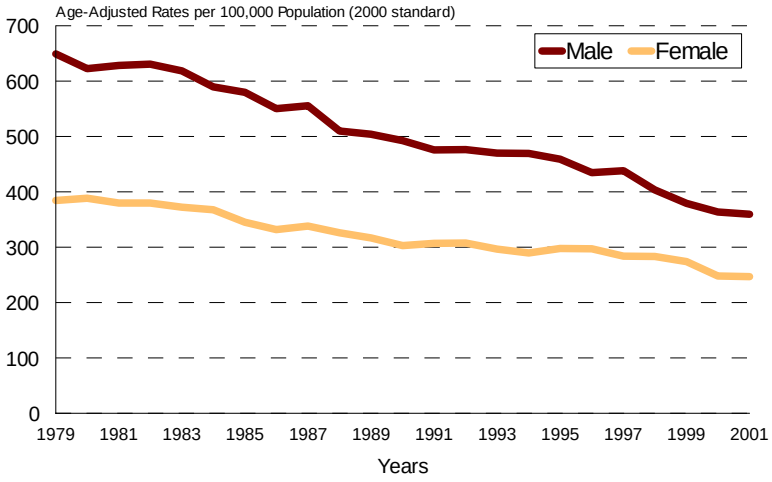
*Codes: ICD-9 390-459; ICD-10 I00-I99
**Age-specific rate per 100,000 population
^1999-2001 rate is significantly lower than the 1979-1983 race at the .001 level
Source: Nebraska Vital Records

Total CVD Mortality by Gender

Cardiovascular disease remains the leading cause of death among both genders in Nebraska. In 2001, the rate of CVD mortality among Nebraska males was 45 percent higher than the rate among Nebraska females, 359.5 to 247.2 deaths per 100,000 population respectively (age-adjusted) (Figure 6).

Trends in CVD mortality (based on age-adjusted rates) are declining faster among males than females. As a result, the gap in CVD mortality risk between males and females is declining (Figure 6). Between 1979 and 2001, the CVD mortality rate declined 44.6 percent among males compared to 35.7 percent among females. This has caused the male to female rate ratio to decline from 1.69 in 1979 to 1.45 in 2001.

Figure 6: Nebraska CVD Mortality Trends* by Gender, 1979-2001



*Includes ICD-9 Codes 390-459 and ICD-10 Codes I00-I99
Source: Nebraska Vital Records

In contrast to the mortality rate, more females than males die from CVD each year in Nebraska (due to a larger older adult female population). In 2001, 3,159 Nebraska females died from CVD compared to 2,604 Nebraska males. While the number of deaths per year is declining among both genders, females are declining at a slower pace than males in Nebraska (14.0 percent to 33.1 percent respectively between 1979 and 2001).

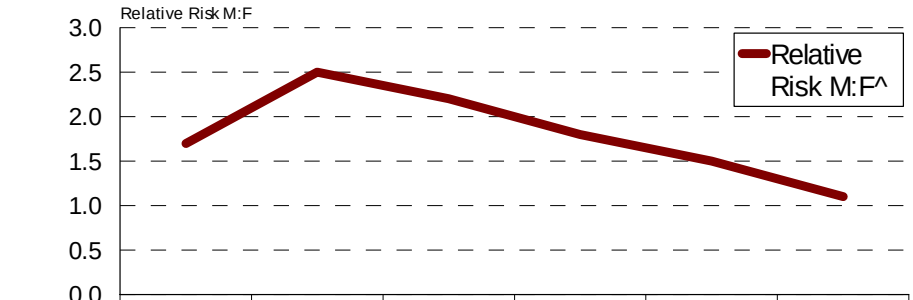
In 2000, males and females in Nebraska were less likely than males and females nationally to die from CVD. Compared to all other states and the District of Columbia, males and females in Nebraska each ranked 12th lowest in their rate of CVD mortality in 2000 (interquartile rate ranges of 365.8-448.3 and 251.2-312.9 respectively)[10].

On average, males die from CVD at a younger age than females. In 2001, males died from CVD at an average age of 76.3 years old while females died from CVD at an average age of 83.5 years old. In addition, as compared to females, males lost nearly twice as many years of productive life between 1999 and 2001 (39,413 years to 20,386 years respectively). This indicates that, on average, males lost substantially more years of productive life per CVD death than females between 1999 and 2001 (5.0 years to 2.1 years respectively).

Males are more likely than females to die of CVD in all age categories, however, disparities in death risk are most prominent within middle aged adults (45-64 years of age) (Figure 7). Among middle aged adults in Nebraska, males were 2.5 times more likely than females to die from CVD between 1999 and 2001 (based on their age-specific mortality rates). Furthermore, a larger number of actual CVD deaths occurred among middle aged males, compared to females (1,365 deaths and 641 deaths respectively).

Although a larger number of males than females are dying prematurely from CVD, trends in premature mortality are improving among both genders (Figure 8). Between 1979-1983 and 1999-2001, among middle aged adults in Nebraska, (age-specific) heart disease mortality rates declined more sharply for males than females, 58.1 percent and 46.5 percent declines respectively. While these declines are encouraging, recent increases in obesity, which are most prominent among middle age Nebraska adults, threatens to stabilize or reverse the improvements made in CVD mortality (see Chapter 4 for further detail on obesity trends).

Figure 7: Relative Risk for CVD Mortality* in Nebraska by Gender and Age, 1999-2001



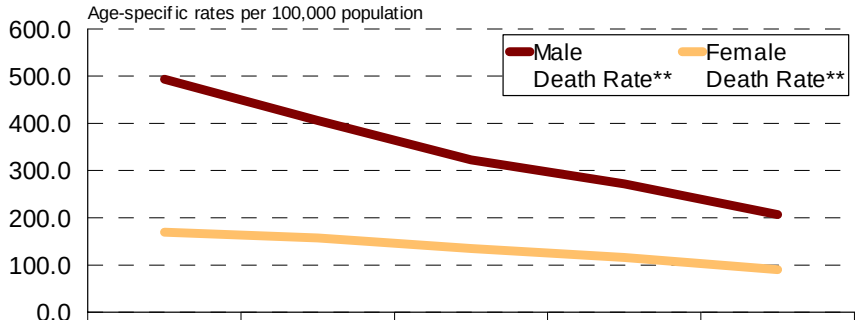
	<45	45-54	55-64	65-74	75-84	85+
Male Death Rate**	13.9	123.4	347.1	949.1	2,695.9	8,220.5
Female Death Rate**	8.1	48.7	158.3	529.1	1,833.2	7,314.3
*Relative Risk M:F^*	*1.7*+	*2.5*+	*2.2*+	*1.8*+	*1.5*+	*1.1*+

Age-Categories

*ICD-10 Codes I00-I99
^Relative risk represented the male to female rate ratio
Source: Nebraska Vital Records

**Age-Specific Death Rates per 100,000 Population
+The male rate is significantly higher than the female rate at the .001 level

Figure 8: Premature CVD Mortality Trends* by Gender
Among Nebraska Residents Aged 45-64, 1979-2001



	1979-1983	1984-1988	1989-1993	1994-1998	1999-2001
Male Death Rate**	493.0	406.3	322.4	272.2	206.4^
Female Death Rate**	169.5	157.9	135.1	116.1	90.7^
*Relative Risk M:F***	*2.9*+	*2.6*+	*2.4*+	*2.3*+	*2.3*+

Years

*ICD-9 Codes 390-459; ICD-10 Codes I00-I99
**Age-Specific Death Rates per 100,000 Population
***Relative risk represented the male to female rate ratio
Source: Nebraska Vital Records

+The male rate is significantly higher than the female rate at the .001 level
^The 1999-2001 rate is signifantly lower than the 1979-1983 rate at the .001 level

Total CVD Mortality by Race/Ethnicity

The vast majority of CVD deaths in Nebraska occur among White residents (the result of a predominately White population). Between 1999 and 2001, 97 percent of CVD deaths in Nebraska occurred among White residents (Table 4).

Among all racial and ethnic groups in Nebraska, Native Americans suffer the greatest risk for CVD mortality followed by African Americans (Figure 9). Between 1999 and 2001, Native Americans died from CVD at an age-adjusted rate of 502.9 deaths per 100,000 population followed by African Americans at a rate of 395.3. In contrast, White Nebraskans died from CVD at an age-adjusted rate (2000 standard) of 305.2 deaths per 100,000 population. This indicates that Native Americans and African Americans are 1.66 and 1.33 times (or 66% and 33%) more likely than Whites to die from CVD respectively.

Table 4: CVD Mortality* by Race/Ethnicity, 1999-2001

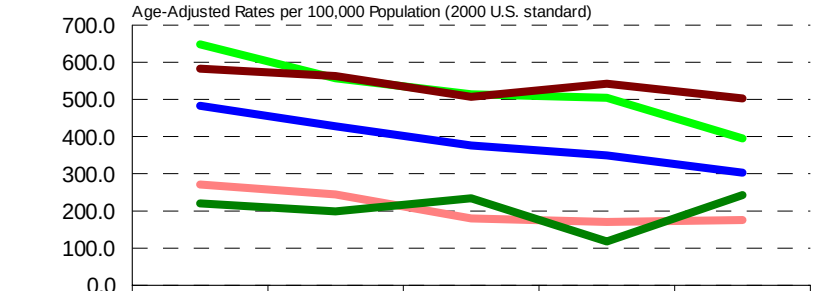
Racial or Ethnic Group	Total Number of CVD Deaths, 1999-2001	Average Number of CVD Deaths per Year, 1999-2001	Percentage of all CVD Deaths, 1999-2001
African American	444	148	2.5%
Asian	38	13	0.2%
Native American	92	31	0.5%
White	17,050	5,683	96.7%
Other Race	8	3	0.0%
Hispanic**	113	38	0.6%

*ICD-10 Codes I00-I99
**Hispanic can be of any race
Source: Nebraska Vital Records

Unlike Native Americans and African Americans in Nebraska, Hispanics (of any race) and Asians are less likely than Whites to die from CVD. Between 1999 and 2001, Hispanics died from CVD at an age-adjusted rate of 175.9 deaths per 100,000 population while Asians died at a rate of 242.3. This indicates that compared to the White population in Nebraska, Hispanics have a relative risk for CVD mortality of 0.58 while Asians have a relative risk for CVD mortality of 0.80.

Reasons for the racial and ethnic disparities in CVD mortality in Nebraska, while somewhat unclear, are believed to result from a wide variety of factors. These factors include (but are not limited to) differences in preventable risk factors for CVD, genetic predisposition, access to medical care, and quality of medical care. To better understand these disparities within Nebraska, more in-depth studies are needed.

Figure 9: Nebraska CVD Mortaltiy Trends* by Race, 1979-2001



	1979-1983	1984-1988	1989-1993	1994-1998	1999-2001
Nat. American	582.9	563.1	507.0	542.3	502.9+
Afr. American	648.4	556.9	514.1	504.2	395.3+,^^
White	482.9	428.0	375.8	349.5	302.5^^
Asian	220.6	199.0	234.2	118.0	242.3
Hispanic**	271.1	244.6	180.0	170.2	175.9+,^

Year Categories

*ICD-9 Codes 390-459; ICD-10 Codes I00-I99, age-adjusted rates per 100,000 population (2000 U.S. standard)
**Hispanics can be of any race
+Between 1999-2001, the race/ethnicity rate is significantly different from the white rate at the .001 level
^,^^The 1999-2001 rate is signifantly lower than the 1979-1983 rate at the .05 or .001 level respectively
Source: Nebraska Vital Records

Cardiovascular disease mortality trends (based on age-adjusted rates) are declining among African Americans, Hispanics, and Whites in Nebraska while they remain statistically unchanged for Native Americans and Asians (Figure 9).

In Nebraska, racial and ethnic disparities in CVD mortality tend to be greater among females than males. Between 1999 and 2001, African American females were 41 percent more likely than White females to die from CVD, while Native American females were twice as likely (97% more likely) as White females to die from CVD (based on their age-adjusted mortality rates).

Due in large part to younger adult populations, the average age at the time of death is lower among all racial and ethnic groups when compared to Whites (Table 5). In addition, the average YPLL per death is also higher among all racial and ethnic groups, with the highest productive life lost per death occurring among Native Americans.

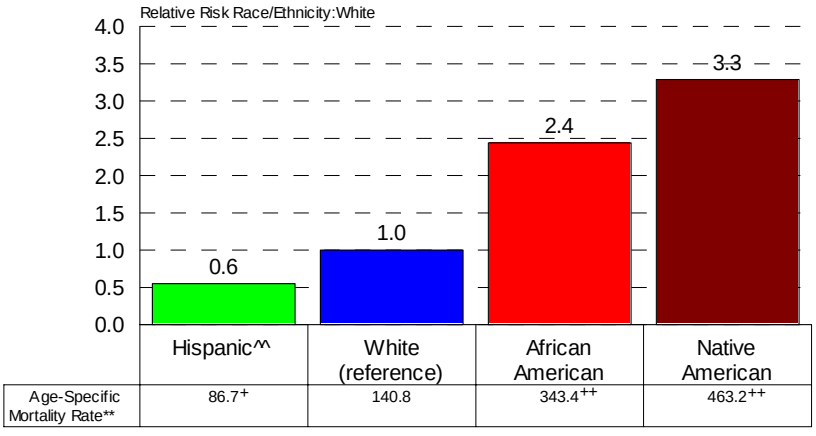
Table 5: CVD YPLL and Average Age at Death in Nebraska* by Race/Ethnicity, 1999-2001

Race/Ethnicity	Average age at the time of CVD death	Total YPLL for CVD	Average YPLL per CVD death	Percentage of CVD deaths that occurred under 65 years of age
African American	69.1	4,605	10.4	35.1%
Asian	72.2	259	6.8	21.1%
Native American	66.0	1,052	11.4	42.4%
White	80.7	53,771	3.2	10.6%
Hispanic**	70.4	1,060	9.4	31.9%

*ICD-10 Codes I00-I99
**Hispanic can be of any race
Source: Nebraska Vital Records

The most profound racial and ethnic disparities in CVD mortality occur among residents under the age of 65. Among middle aged adults (45-64 years of age) in Nebraska, Native Americans were 3.3 times more likely than Whites to die from CVD between 1999 and 2001. Figure 10 provides CVD mortality risk information for each race/ethnicity compared to the White population for middle aged adults between 1999 and 2001.

Figure 10: Relative Risk^ for Premature CVD Mortality* by Race
Among Nebraska adults aged 45-64, 1999-2001



*ICD-10 Codes I00-I99
^Relative risk represents the race/ethnicity to white rate ratio
^^Hispanics can be of any race
Note: Insufficient data were available to calculate a mortality rate for Asians
Source: Nebraska Vital Records

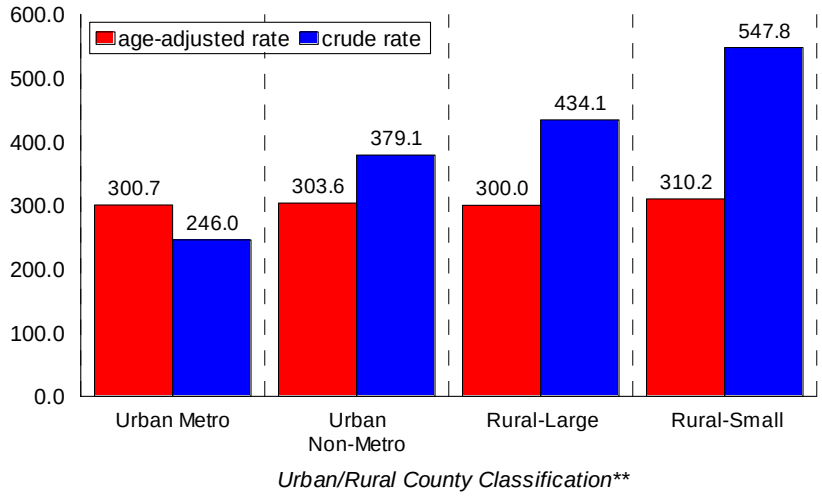
**Age-Specific mortality rates per 100,000 population
+,++The race/ethnicity rate is significantly different from the white rate at the .01 or .001 level respectively

Total CVD Mortality by Geographical Distribution

Between 1999 and 2001, risk for heart disease mortality (based on age-adjusted rates) did not differ (statistically) between residents of urban and rural counties in Nebraska. *For further detail on urban/rural categories, see the Methodology Section.*

In contrast to the differences observed through age-adjusted mortality rates, crude rates indicate that a larger proportion of Nebraska residents in rural counties, compared to urban counties, die from CVD (primarily due to larger older adult populations within rural counties) (Figure 11). While crude rates are not particularly useful for comparing risk among different populations (since they do not adjust for age differences between populations), they are useful for identifying the rate of actual death that occurs within a population. Knowing this information allows the health care system to be better prepared to deal with life-threatening CVD.

Figure 11: Nebraska CVD Mortality Rates* by Urban/Rural, 1999-2001



*ICD-10 codes I00-I99
**See Methodology Section for detail on urban/rural county classifications.
Source: Nebraska Vital Records

The average YPLL per CVD death is highest among residents of urban metropolitan counties in Nebraska and declines gradually as county of residence becomes more rural (Table 6). In addition, residents of urban metropolitan counties are, on average, younger at their time of CVD death than residents of other Nebraska counties (Table 6).

Table 6: CVD YPLL and Average Age at Deaths in Nebraska* by Urban/Rural County Classification, 1999-2001

Urban/Rural Category**	Number of CVD deaths	Total YPLL for CVD	Average YPLL per CVD death	Average age at the time of CVD death
Nebraska Total	17,632	59,799	3.4	80.3
Urban Metropolitan	6,172	27,933	4.5	77.9
Urban Non-Metropolitan	4,199	12,981	3.1	80.9
Rural-Large	4,000	10,772	2.7	81.6
Rural-Small	3,261	8,114	2.5	82.4

*ICD-10 Codes I00-I99
**See Methodology Section for detail on urban/rural county classifications
Source: Nebraska Vital Records

Total CVD Mortality by Medicaid Enrollment

Medicaid enrollees in Nebraska are more likely than non-Medicaid enrollees in Nebraska to die from CVD (Table 7). In 2001, 1,459 Nebraska residents died from CVD while enrolled in Medicaid. This indicates that Medicaid enrollees accounted for 1 in every 4 CVD deaths (25.3%) in 2001 while accounting for just 11 percent of Nebraska's population.

In 2001, Medicaid enrollees in Nebraska were 3.5 times more likely than non-Medicaid enrollees in Nebraska to die from CVD. Aside from differences in age, Medicaid enrollment status has a stronger association with CVD mortality than any other sub-population presented within this report.

Nebraska's Medicaid population consists of predominately women and children. As a result, approximately 7 in every 10 Medicaid deaths due to CVD (69.1%) occurred among females in 2001. However, male Medicaid enrollees are more likely than female Medicaid enrollees to die from CVD (based on their age-adjusted CVD mortality rates). In 2001, male Medicaid enrollees were 65 percent more likely than female Medicaid enrollees to die from CVD.

It is particularly concerning that some of the greatest disparities in CVD mortality, between Medicaid and non-Medicaid enrollees occur among adults during their most productive years of life. Medicaid enrollees aged 25-44 years and aged 45-64 years were far more likely than non-Medicaid enrollees (within the same age categories) to die from CVD in 2001 (5.74 and 6.10 times more likely respectively).

Table 7: CVD Mortality*: Medicaid vs Non-Medicaid, 2001

	Medicaid Enrollees**			Non-Medicaid Enrollees			Relative Risk^^
	# Deaths	Death Rate^	Population	# Deaths	Death Rate^	Population	Med:Non-Med
Overall	1,459	852.4	194,055	4,304	246.9	1,530,373	3.45+
Gender							
Female	1,008	725.7	112,087	2,151	195.9	761,677	3.70+
Male	451	1,195.6	81,968	2,153	315.5	768,696	3.79+
Race							
Asian	4	-	2,235	7	-	23,735	-
Native American	22	1,144.9	6,900	14	-	9,145	-
African American	70	807.3	26,535	88	313.7	44,361	2.57+
Hispanic	16	-	21,742	21	105.2	77,249	-
White	1,363	887.4	133,358	4,194	243.6	1,445,929	3.64+
Age							
<25	10	7.4	134,607	15	3.0	493,932	2.47
25-44	29	102.8	28,207	82	17.9	458,948	5.74+
45-64	98	762.9	12,845	454	125.1	362,770	6.10+
65+	1,322	7,186.4	18,396	3,753	1,747.8	214,724	4.11+

*ICD-10 Codes I00-I99

**Medicaid deaths consist of Nebraska residents enrolled in Medicaid at their time of death. Medicaid population data represents enrollment eligibility years for 2001 (or the # of enrollees if everyone enrolled was enrolled for an entire year).

^Age-adjusted rate per 100,000 pop (2000 U.S. standard population) (Note: rates for age categories are age-specific)

^^Relative Risk represents the Medicaid to non-Medicaid rate ratio

+Medicaid rate is significantly higher than the non-Medicaid rate at the .001 level

- Insufficient data to calculate statistic

Source: Nebraska Vital Records

Heart Disease

Definition: Heart disease is a form of cardiovascular disease; it includes all diseases of the heart, which includes acute rheumatic fever and chronic rheumatic heart disease, hypertensive heart disease, hypertensive heart and renal disease, coronary heart disease, congestive heart failure, as well as other forms of heart disease

Codes used to define heart disease: ICD-10 codes I00-I09, I11, I13, I20-I51, ICD-9 codes (390-398, 402, 404, 410-429), Comparability Ratio 0.9858

Heart Disease Highlights

National Highlights

- Heart disease killed 710,760 U.S. residents in 2000[2].
- Heart disease death rates are higher in the south-eastern United States[2].
- One coronary death occurs every minute in the U.S[2].
- Nearly 3 in every 4 heart disease deaths result from coronary heart disease[10].
- Coronary heart disease is the single largest killer of American males and females[2].
- Each year about 340,000 U.S. residents die from CHD in an emergency department or before reaching the hospital[2].

Nebraska Highlights

- Heart disease was responsible for 1 in every 3.7 deaths in 2001.
- Heart disease accounted for nearly 3 in every 4 total CVD deaths in 2001.
- Heart disease killed 4,151 Nebraska residents in 2001.
- The mortality rate (age-adjusted) for heart disease declined 39 percent between 1979 and 2001.
- 3 in every 4 heart disease deaths occur among Nebraska residents aged 75 and older.
- Males are 1.6 times more likely than females to die of heart disease (based on their age-adjusted mortality rate), however more females than males actually die from heart disease each year.
- African Americans and Native Americans are more likely than all other racial and ethnic groups to die of heart disease.
- Medicaid enrollees were 3.2 times more likely than non-Medicaid enrollees to die of heart disease (based on their age-adjusted rates) in 2001.

Overall Heart Disease Mortality

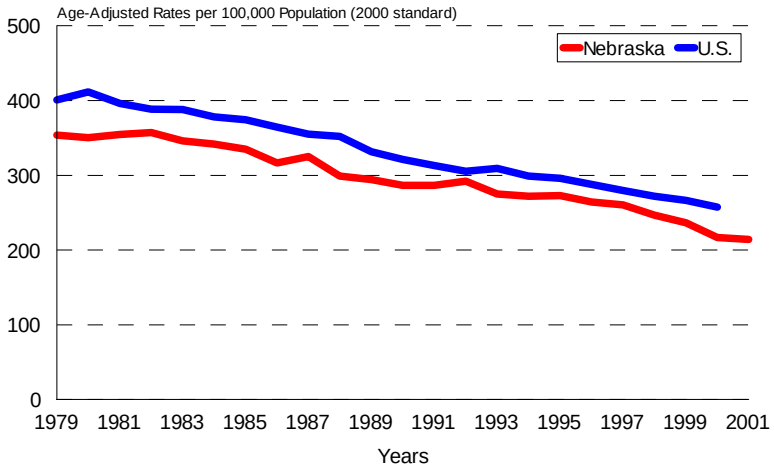
Independent of other forms of CVD, heart disease is the leading killer of Nebraska residents. In 2001, heart disease claimed the lives of 4,151 Nebraska residents, of which 532 were under the age of 65. Heart disease accounts for approximately 1 in every 5 deaths in Nebraska.

Heart disease mortality in both Nebraska and the U.S. has been steadily declining since the late 1970s (Figure 12). Between 1979 and 2001, Nebraska's age-adjusted heart disease mortality rate declined 39.4 percent.

Nebraska residents are less likely than U.S. residents to die from heart disease. In particular, the Nebraska to U.S. relative risk (or rate ratio) for heart disease mortality (based on age-adjusted mortality rates) is 0.84[10]. In 2000, Nebraska's heart disease mortality rate ranked 13th lowest among all 50 states and the District of Columbia (interquartile rate range 217.0-279.2)[10].

The actual numbers of deaths from heart disease in Nebraska is declining (although at a slower pace than the age-adjusted mortality rate).There were 5,403 heart disease deaths in 1979 compared to 4,151 heart disease deaths in 2001, indicating an average decline of 57 deaths per year (or a 23.2% overall decline). In contrast, the number of heart disease deaths in the U.S. declined only 2.9 percent between 1979 and 2000[10].

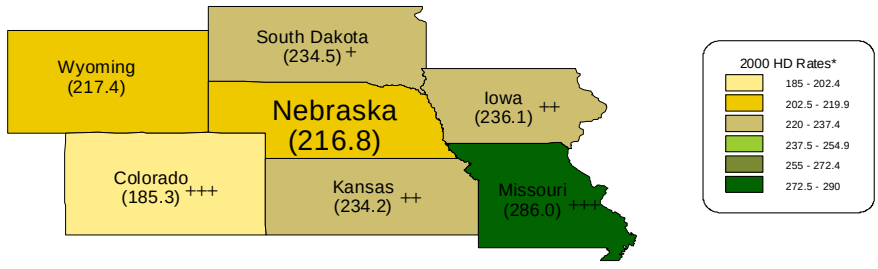
Figure 12: Heart Disease Mortality Trends*, 1979-2001



*Includes ICD-9 Codes 390-398, 402, 404, 410-429; ICD-10 Codes I00-I09, I11, I13, I20-I51; comparability ratio (.9981) applied to data from years 1979-1998
Sources: Nebraska Vital Records; CDC Wonder, Mortality Data, <http://wonder.cdc.gov>

Rates for heart disease in Nebraska compare well to bordering states. In 2000, only Colorado had a lower (age-adjusted) heart disease mortality rate than Nebraska, while Iowa, Kansas, Missouri and South Dakota had higher (age-adjusted) heart disease mortality rates than Nebraska (Map 2)[1,10]. In particular, Missouri residents were 31 percent more likely than Nebraska residents to die from CVD in 2000[10]. While heart disease mortality rates in Nebraska are lower than many bordering states, heart disease still presents many challenges and opportunities within both public health and health care in Nebraska. To remain ahead of the curve, Nebraska must strive to create and implement new and aggressive plans to address heart disease in future years.

Map 2: Heart Disease Death Rates* for Nebraska and Bordering States, 2000

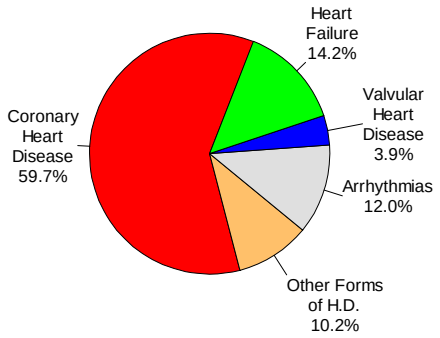


*Age-adjusted rate per 100,000 population (2000 U.S. standard) using ICD-10 Codes I00-I09, I11, I13, I20-I51
+,++,+++Rate is significantly different from the Nebraska rate at the .05, .01, or .001 level respectively
Sources: Nebraska Vital Records; CDC Wonder, Mortality Data, <http://www.wonder.cdc.gov/>

There are a variety of different diseases of the heart that contribute to mortality in Nebraska (Figure 13). Between 1999 and 2001, coronary heart disease (CHD) accounted for approximately 3 in every 5 heart disease deaths. Other leading causes of heart disease death include heart failure (14.2%) and arrhythmias (12.0%).

Between 1999 and 2001, a higher percentage of male than female heart disease deaths resulted from CHD, 64.1 percent to 55.9 percent respectively. In contrast, a higher percentage of female than male heart disease deaths resulted from valvular heart disease and heart failure, 4.8 to 2.8 percent and 16.3 to 11.7 percent respectively.

Figure 13: Types of Heart Disease* Death in Nebraska Percentage Breakdown, 1999-2001



*Includes ICD-10 codes I00-I09, I11, I13, I20-I51; codes for specific diseases can be found in the methodology section of this report.
Source: Nebraska Vital Records

Preventable Risk Factors for Heart Disease

There are a variety of preventable risk factors for heart disease morbidity and mortality. While many of these risk factors are highly correlated with one another, each is uniquely important to heart disease prevention and should be a primary focus for decreasing heart disease in Nebraska. *See chapter 4 for more information on preventable risk factors.*

High Blood Pressure - About half of people who have a first heart attack have blood pressures higher than 160/95 mm Hg[11]. Hypertension precedes the development of congestive heart failure (CHF) in 91 percent of cases[12]. High blood pressure is also associated with a 2-3 times greater risk for developing CHF[12].

High Blood Cholesterol - The risk of coronary heart disease (CHD) increases as blood cholesterol levels rise. Fortunately, as little as a 10 percent decline in total cholesterol levels may result in an estimated 30-percent reduction in the incidence of coronary heart disease[13].

Lack of Physical Activity - Physical activity is as important to the development of CHD as controlling high blood pressure, controlling high blood cholesterol, and not smoking[14]. Physically inactive people are almost twice as likely to develop CHD as people who engage in regular physical activity[15].

Unhealthy Eating - Healthy eating helps to prevent heart disease for a variety of reasons. In particular, fruit and vegetable consumption, particularly green leafy vegetables and vitamin C-rich fruits and vegetables, appear to have a protective effect against coronary heart disease[16]. People who consume eight or more servings of fruits and vegetables per day are at over 20 percent reduced risk of CHD compared to those who consumed less than three servings per day[16].

Smoking - Cigarette smoking dramatically increases an individual's risk for heart disease. However, the promising news is that if current smokers stop smoking, their risk of CHD declines 50 percent within 1 year[17]. In addition to actually smoking cigarettes, second-hand exposure to cigarette smoke also dramatically increases an individual's risk for heart disease. In fact, the risk of death from CHD increases by up to 30 percent among those exposed to environmental tobacco smoke at home or work[2].

Overweight and Obesity - Overweight and obese adults are more likely than adults at a healthy weight to develop heart disease. A gain of approximately 10 to 20 pounds may result in an increased risk of coronary heart disease (nonfatal myocardial infarction and death) of 1.25 times in women[18] and 1.6 times in men[19]. High levels of weight gain, 22 pounds in men and 44 pounds in women, may result in an increased coronary heart disease risk of 1.75 and 2.65, respectively[18,19].

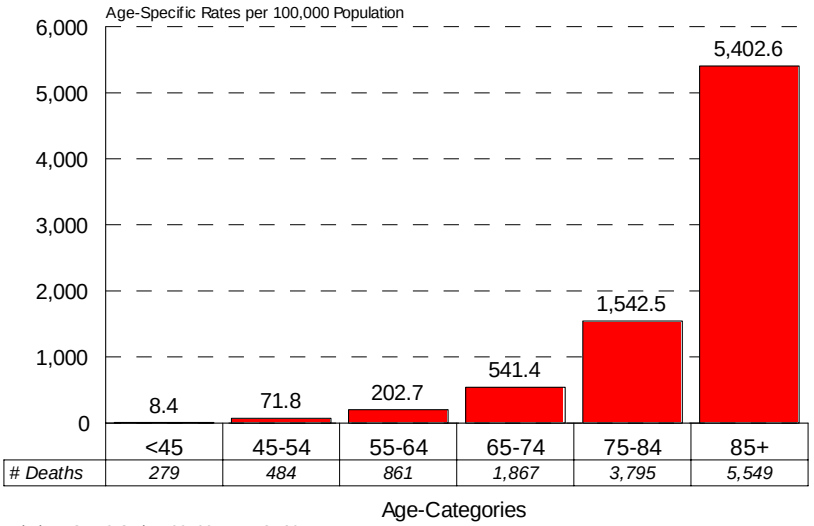
Diabetes - Diabetic patients compared to non-diabetics, have an almost twofold increase in dying or suffering severe outcomes from heart disease[20].

Stress - While not conclusive, some research is indicating a relationship between the risk of CVD and environmental and psychosocial factors (such as job strain, social isolation, and personality traits)[21]. Before implementing stress reduction programs, more research is needed on how stress contributes to heart disease[21].

Heart Disease Mortality by Age

Risk of death from heart disease increases dramatically as age increases, making age the greatest single predictor of heart disease mortality for Nebraska residents (Figure 14). Between 1999 and 2001, approximately 3 in every 4 heart disease deaths occurred among residents 75 and older.

Figure 14: Nebraska Heart Disease Mortality Rates* by Age, 1999-2001



*Includes ICD-10 Codes I00-I09, I11, I13, I20-I51
Source: Nebraska Vital Records

Although most heart disease deaths occur among older adults in Nebraska, heart disease does claim a large number of lives prematurely (before age 65). Between 1999 and 2001, heart disease prematurely killed, on average, 541 Nebraska residents per year. Heart disease is responsible for greater than 1 in every 6 premature Nebraska deaths.

The trend in heart disease mortality among residents under 45 has not changed in more than 20 years, while rates among middle and older adults have declined sharply (Table 8). In particular, the rate among middle aged adults (45-64 years of age) declined 56 percent between 1979-1983 and 1999-2001.

Table 8: Trends in Heart Disease Mortality* by Age in Nebraska

	<45		45-64		65+	
years	Average # deaths/year	rate**	Average # deaths/year	rate**	Average # deaths/year	rate**
1979-1983	95	8.9	805	275.3	4,680	2,255.9
1984-1988	84	7.8	685	238.0	4,659	2,154.6
1989-1993	87	8.1	555	190.9	4,458	1,986.1
1994-1998	98	9.0	526	160.2	4,322	1,888.1
1999-2001	93	8.5	448	121.1	3,737	1,617.9
% change: 79-83 to 99-01	-2.1%	-4.8%	-44.3%	-56.0%^	-20.1%	-28.3%^

*Codes: ICD-9 390-398, 402, 404, 410-429; ICD-10 I00-I09, I11, I13, I20-I51; comparability ratio (0.9981) applied to years 1979-1998

**Age-specific rate per 100,000 population

^1999-2001 rate is significantly lower than the 1979-1983 race at the .001 level

Source: Nebraska Vital Records

Heart Disease Mortality by Gender

Heart disease is the leading killer of both males and females in Nebraska. In 2001, heart disease accounted for more than 1 of every 4 deaths among males (26.9%) and females (27.7%).

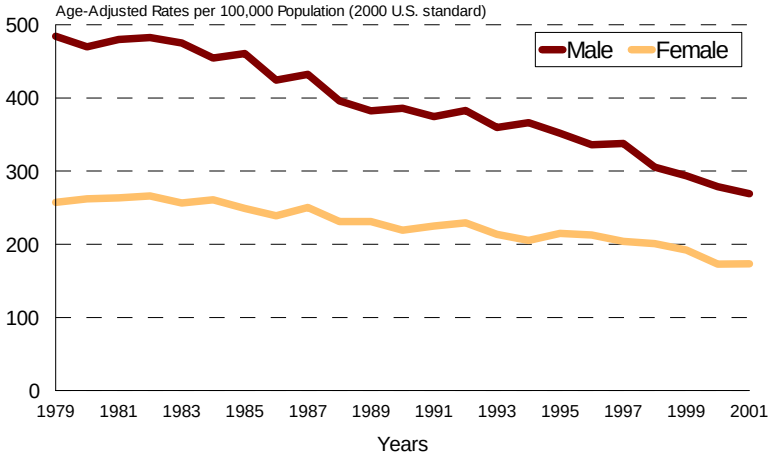
Heart disease death rates in Nebraska among both males and females compare well to other U.S. states. In 2000, Nebraska males ranked 12th lowest while Nebraska females ranked 13th lowest in their rate of heart disease mortality (age-adjusted) compared to all other states and the District of Columbia (interquartile rate ranges 279.0-347.3 and 173.5-230.1 respectively)[10].

Males are more likely than females to die from heart disease in Nebraska (Figure 15). In 2001, males were 1.55 times (or 55%) more likely than females to die from heart disease. While the gender disparity is still large, the fact that the relative risk has declined from 1.88 in 1979 to 1.55 in 2001 is encouraging.

In contrast to the mortality rate, more Nebraska females than males actually die from heart disease each year (due to a larger female older adult population). In 2001, heart disease killed 2,217 females compared to 1,934 males. While the number of heart disease deaths is declining among both males and females, they are declining at a much slower pace among females compared to males, 9.7 percent and 34.4 percent respectively between 1979 and 2001.

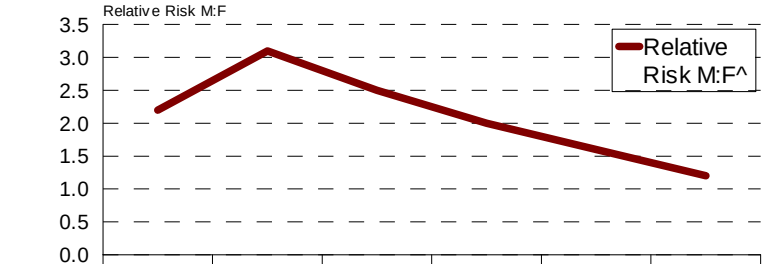
While heart disease claims a large number of lives prematurely among both males and females, males are more likely to die prematurely from heart disease (Figure 16). In addition, between 1999 and 2001, heart disease claimed more than twice as many years of productive life among males than females, 33,036 and 14,312 respectively.

Figure 15: Nebraska Heart Disease Mortality Trends* by Gender



*Includes ICD-9 Codes 390-398, 402, 404, 410-429; ICD-10 Codes I00-I09, I11, I13, I20-I51; comparability ratio (.9981) applied to data from years 1979-1998
Source: Nebraska Vital Records

Figure 16: Relative Risk for Heart Disease Mortality* in Nebraska by Gender and Age, 1999-2001



	<45	45-54	55-64	65-74	75-84	85+
Male Death Rate**	11.6	108.5	293.9	741.4	1,988.8	5,979.8
Female Death Rate**	5.2	35.4	116.1	372.3	1,242.8	5,175.9
*Relative Risk M:F^*	*2.2*+	*3.1*+	*2.5*+	*2.0*+	*1.6*+	*1.2*+

Age-Categories

*ICD-10 Codes I00-I09, I11,I13, I20-I51
^Relative risk represents the male to female rate ratio
Source: Nebraska Vital Records

**Age-Specific Death Rates per 100,000 Population
+The male rate is significantly higher than the female rate at the .001 level

Heart Disease Mortality by Race

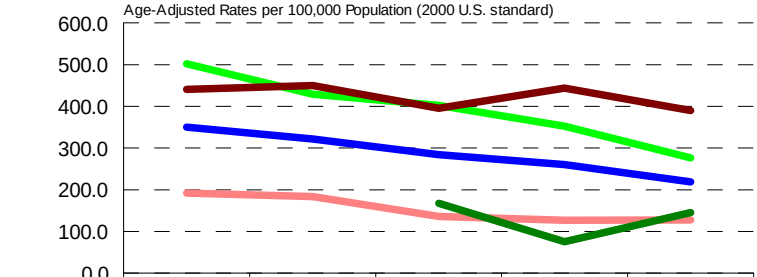
Large disparities in heart disease mortality exist between different racial and ethnic groups in Nebraska, making race an important non-preventable risk factor for heart disease. Between 1999 and 2001, Native Americans, followed by African Americans, were the most likely racial groups to die from heart disease (Figure 17). Compared to the White (majority) population in Nebraska, between 1999 and 2001, Native Americans and African Americans were 1.78 and 1.26 times more likely to die from heart disease respectively. In contrast, between 1999 and 2001, Asians and Hispanics were less likely than Whites to die from heart disease (relative risks of .67 and .58 respectively).

The high death rate and relatively stable trend from heart disease among Native Americans in Nebraska is concerning (Figure 17). Between 1991 and 1995, the rate of heart disease death (age-adjusted) among Native American men in Nebraska, aged 35 and older, ranked 34th highest out of 35 states[22] while Native American women in Nebraska, aged 35 and older, ranked 31st highest out of 32 states[23].

In Nebraska, the greatest disparities in heart disease death, between the White and minority populations, occurs among residents during their pre-retirement years (specifically between 45-64 years of age) (Figure 18).

The average years of productive life lost (YPLL) per heart disease death vary dramatically between different racial and ethnic groups. Between 1999 and 2001, average YPLL per heart disease death were as follows: 3.4 among Whites, 6.6 among Asians, 8.5 among Hispanics, 11.1 among African Americans, and 12.0 among Native Americans. Even though YPLL is strongly influenced by the average age of the population, such dramatic differences are concerning.

Figure 17: Trends in Nebraska Heart Disease Mortaltiy* by Race



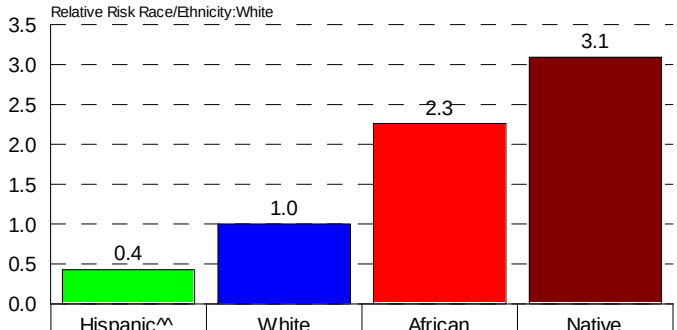
	1979-1983	1984-1988	1989-1993	1994-1998	1999-2001
Nat. American	441.0	450.1	395.9	444.0	390.3+++
Afr. American	502.3	429.0	402.2	352.7	276.9++,^
White	350.4	321.5	284.0	260.1	218.9^
Asian	-	-	167.7	75.2	145.6+
Hispanic**	192.4	183.9	135.9	127.2	127.4+++

Year Categories

*Includes ICD-9 Codes 390-398, 402, 404, 410-429; ICD-10 Codes I00-I09, I11, I13, I20-I51; comparability ratio (.9981) applied to data from years 1979-1998
**Hispanics can be of any race
Source: Nebraska Vital Records

-Insufficient data to calculate rate
+,++,+++Between 1999-2001, the race/ethnicity rate is significantly different from the white rate at the .05, .01, or .001 levels respectively
^The 1999-2001 rate is signifantly lower than the 1979-1983 rate at the .001 level

Figure 18: Relative Risk^ for Premature Heart Disease Mortality*
Among Nebraska adults aged 45-64 by Race/Ethnicity, 1999-2001



	Hispanic^^	White (reference)	African American	Native American
Age-Specific Mortality Rate**	62.5+	116.1	262.7+	358.6+

*ICD-10 Codes I00-I09, I11, I13, I20-I51
^Relative risk represents the race/ethnicity to white rate ratio
^^Hispanics can be of any race
Note: Insufficient data were available to calculate a mortality rate for Asians
Source: Nebraska Vital Records

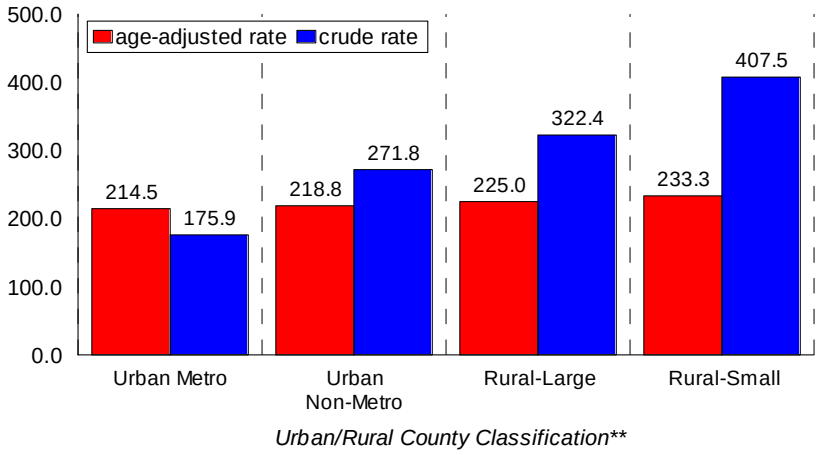
**Age-Specific mortality rates per 100,000 population
+The race/ethnicity rate is significantly different from the white rate at the .001 level

Heart Disease Mortality by Geographic Distribution

Residents of rural Nebraska counties are slightly more likely than residents of urban Nebraska counties to die from heart disease (based on their age-adjusted mortality rates) (Figure 19). Between 1999 and 2001, residents of rural-small counties in Nebraska were 9 percent more likely than residents of urban metropolitan counties in Nebraska to die from heart disease. *For further detail on urban/rural categories, see Methodology Section.*

In contrast to the differences observed through age-adjusted mortality rates, crude rates indicate that a much larger proportion of Nebraska residents in rural counties, compared to urban counties, die from heart disease (primarily due to larger older adult populations within rural counties) (Figure 19). While crude rates are not particularly useful for comparing risk among different populations (since they do not adjust for age differences between populations), they are useful for identifying the rate of actual death that occurs within a population. Knowing this information allows the health care system to be better prepared to deal with life-threatening heart disease.

Figure 19: Nebraska Heart Disease Mortality Rates* by Urban/Rural, 1999-2001



*ICD-10 codes I00-I09, I11, I13, I20-I51, rates per 100,000 population
**See Methodology Section for further detail on urban/rural county classifications.
Source: Nebraska Vital Records

The average YPLL per heart disease death is highest among residents of urban metropolitan counties in Nebraska and declines gradually as county of residence becomes more rural (Table 9). In addition, residents of urban metropolitan counties are, on average, younger at their time of heart disease death than residents of other Nebraska counties (Table 9).

Table 9: Heart Disease* YPLL and Average Age at Deaths in Nebraska by Urban/Rural County Classification, 1999-2001

Urban/Rural Category**	Number of HD deaths	Total YPLL for HD	Average YPLL per HD death	Average age at the time of HD death
Nebraska Total	12,835	47,348	3.7	79.8
Urban Metropolitan	4,414	21,796	4.9	77.3
Urban Non-Metropolitan	3,010	10,418	3.5	80.4
Rural-Large	2,985	8,467	2.8	81.5
Rural-Small	2,426	6,668	2.7	81.9

*ICD-10 Codes I00-I09, I11, I13, I20-I51
**See Methodology Section for further detail on urban/rural county classifications
Note: YPLL refers to years of productive life lost and measures death among persons under 75 years of age *(see methodology for further detail).*
Source: Nebraska Vital Records

Heart Disease Mortality by Medicaid Enrollment

Medicaid enrollees in Nebraska are more likely than non-Medicaid enrollees in Nebraska to die from heart disease (Table 10). In 2001, 1,003 Nebraska residents died from heart disease while enrolled in Medicaid. This indicates that Medicaid enrollees accounted for approximately 1 in every 4 heart disease deaths in 2001 while accounting for just 11 percent of Nebraska's population.

In 2001, Medicaid enrollees in Nebraska were 3.2 times more likely than non-Medicaid enrollees in Nebraska to die from heart disease. Aside from differences in age, Medicaid enrollment status has a stronger association with heart disease mortality than any other subpopulation presented within this report.

Nebraska's Medicaid population consists of predominately women and children. As a result, approximately 7 in every 10 Medicaid deaths due to heart disease (or 70%) occurred among females in 2001. However, male Medicaid enrollees in Nebraska were 67 percent more likely than female Medicaid enrollees in Nebraska to die from heart disease in 2001 (based on their age-adjusted mortality rates).

It is particularly concerning that some of the most striking disparities in heart disease mortality (between Medicaid and non-Medicaid enrollees) occurred among adults during their most productive years of life. Medicaid enrollees in Nebraska aged 25-44 years and aged 45-64 years were more likely than non-Medicaid enrollees in Nebraska (within the same age categories) to die from heart disease in 2001 (5.14 and 5.11 times more likely respectively).

Table 10: Heart Disease Mortality*: Medicaid vs Non-Medicaid

	Medicaid Enrollees**			Non-Medicaid Enrollees			Relative Risk^^
	# Deaths	Death Rate^	Population	# Deaths	Death Rate^	Population	Med:Non-Med
Overall	1,003	574.1	194,055	3,148	180.8	1,530,373	3.18++
Gender							
Female	701	483.0	112,087	1,516	137.3	761,677	3.52++
Male	302	805.5	81,968	1,632	237.5	768,696	3.39++
Race							
Asian	3	-	2,235	3	-	23,735	
Native American	17	-	6,900	12	-	9,145	
African American	45	527.4	26,535	64	226.7	44,361	2.33+
Hispanic	10	-	21,742	12	-	77,249	
White	938	596.8	133,358	3,068	178.5	1,445,929	3.34++
Age							
<25	9	-	134,607	11	2.2	493,932	
25-44	18	63.8	28,207	57	12.4	458,948	5.14++
45-64	67	521.6	12,845	370	102.0	362,770	5.11++
65+	909	4,941.3	18,396	2,710	1,262.1	214,724	3.92++

*ICD-10 Codes I00-I09, I11, I13, I20-I51

**Medicaid deaths consist of Nebraska residents enrolled in Medicaid at their time of death. Medicaid population data represents enrollment eligibility years for 2001 (or the # of enrollees if everyone enrolled was enrolled for an entire year).

^Age-adjusted rate per 100,000 pop (2000 U.S. standard population) (Note: rates for age categories are age-specific)

^^Relative Risk represents the Medicaid to non-Medicaid rate ratio

+,++Medicaid rate is significantly higher than the non-Medicaid rate at the .01 or .001 level respectively

- Insufficient data to calculate statistic

Source: Nebraska Vital Records

Coronary Heart Disease

Definition[24]: Coronary heart disease (or coronary artery disease) is a narrowing of the small blood vessels that supply blood and oxygen to the heart (coronary arteries). Coronary disease usually results from the build-up of fatty material and plaque (atherosclerosis). As the coronary arteries narrow, the flow of blood to the heart can slow or stop. The disease can cause chest pain (stable angina), shortness of breath, heart attack, or other symptoms.

Codes used to define CHD: ICD-10 codes I20-I25 and ICD-9 codes 390-398, 402, 404-429, Comparability Ratio 0.999

Coronary heart disease (CHD) is a type of heart disease that accounts for nearly 3 in every 5 heart disease deaths in Nebraska. In 2001, CHD killed 2,443 Nebraska residents for a death rate of 125.6 deaths per 100,000 population (age-adjusted). While the age-adjusted death rate for CHD declined 57.9 percent among Nebraska residents between 1979 and 2001, CHD (independent of all other heart diseases) is still the second leading cause of death in Nebraska (second only to cancer).

In 2001, CHD claimed approximately the same number of lives among males and females in Nebraska, 1,206 to 1,237 respectively. However, males were 1.71 times (or 71%) more likely than females to die from CHD based on their age-adjusted rate (Figure 20).

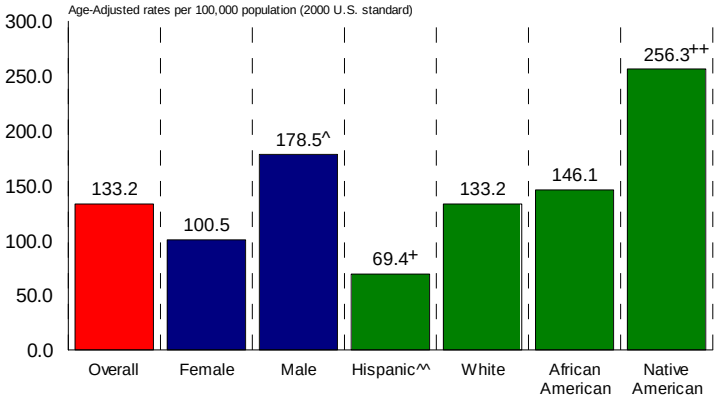
Although CHD is a leading killer in Nebraska, Nebraska residents are less likely than U.S. residents to die from CHD. In particular, U.S. females were 49 percent more likely than NE females while U.S. males were 33 percent more likely than NE males to die from CHD in 2000[10].

Native Americans are more likely than all other racial and ethnic groups to die from CHD in Nebraska (Figure 20). Between 1999 and 2001, Native Americans were nearly twice as likely as Whites (relative risk of 1.92) to die from CHD. In contrast, Hispanics were less likely than Whites to die from CHD in Nebraska between 1999 and 2001 (relative risk of 0.52).

CHD contributes to a large number of premature deaths in Nebraska. Between 1999 and 2001, 837 Nebraska residents aged 45-64 years died from CHD for an age-specific mortality rate of 75.3 deaths per 100,000 population. In contrast, stroke killed 199 Nebraska residents aged 45-64 years between 1999 and 2001, for an age-specific mortality rate of 17.9 deaths per 100,000 population.

According to the American Heart Association, sudden cardiac death is a result of cardiac arrest (when the heart stops abruptly). While most known heart diseases can lead to sudden cardiac death, the most common is CHD.

Figure 20: Nebraska CHD Mortality Rates*, 1999-2001



*ICD-10 Codes I20-I25
^The male rate is significantly higher than the female rate at the .001 level
+,++The race/ethnicity rate is significantly different from the white rate at the .01 or .001 level respectively
^^Hispanics can be of any race
Note: Insufficient data were available to calculate a mortality rate for Asians
Source: Nebraska Vital Records

Sudden Cardiac Death

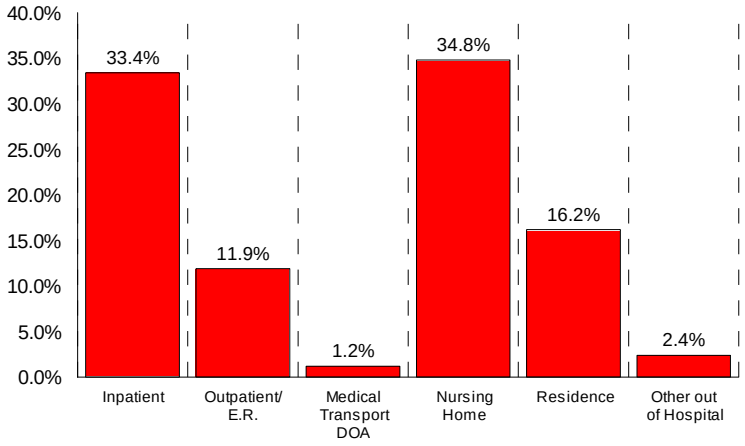
Definition[24]: Sudden cardiac deaths (SCD) result from sudden cardiac arrest, in which the heart stops beating abruptly or unexpectedly. Sudden cardiac death is often associated with coronary heart disease, while the most common underlying cause of sudden cardiac death is heart attack. Sudden cardiac death victims may or may not have diagnosed heart disease.

Methodology used to define SCD: deaths contain ICD-10 codes I00-I09, I11, I13, I20-I51, Q20-Q24 and death occurred in one of the following locations: outpatient, E.R., residence, nursing home, or other out of hospital death.

Each year in the United States, approximately 400,000 to 460,000 persons die of unexpected sudden cardiac death (SCD) in an emergency department (ER) or before reaching a hospital[25]. Heart attacks are a major cause of SCD and approximately 70 percent of SCDs are caused by coronary heart disease[25].

Among the 12,895 cardiac deaths (including all diseases of the heart and congenital malformations of the heart) that occurred in Nebraska between 1999 and 2001, 66.5 percent (or 8,576 deaths) resulted from SCD. Cardiac deaths occur in a wide variety of locations, led by nursing home (34.8%) and inpatient hospitalization (33.4%) (Figure 21).

Figure 21: Location of Cardiac Death in Nebraska*, 1999-2001



*ICD-10 codes I00-I09, I11, I13, I20-I51, Q20-Q24
Note: 13 deaths occurred in an unknown location.
Source: Nebraska Vital Records

Between 1999 and 2001, Nebraska residents died from SCD at an age-adjusted mortality rate of 146.8 deaths per 100,000 population. Males were 1.5 times more likely than females to die from SCD and Native Americans and African Americans were more likely than Whites to die from SCD, 43 percent and 26 percent more likely respectively.

Although SCD leads to a large number of preventable deaths in Nebraska each year, Nebraska ranks well when compared to the nation as a whole. In 1999, U.S. residents were 11 percent more likely than Nebraska residents to die from SCD[26].

Of the 8,875 SCDs that occurred between 1999 and 2001 in Nebraska, 1,121 (or 13.1%) occurred among residents under 65 years of age. As a result, efforts to reduce out-of-hospital (including nursing home, residence, or other out of hospital) deaths from SCD would likely decrease the overall incidence of premature death in Nebraska.

The high mortality rate from SCD indicates a statewide need to engage in efforts to increase public awareness of heart attack signs and symptoms and to reduce the delay time to treatment. In addition, these data also indicate a statewide need to support primary prevention efforts to reduce the number of sudden cardiac deaths from occurring.

Heart Failure

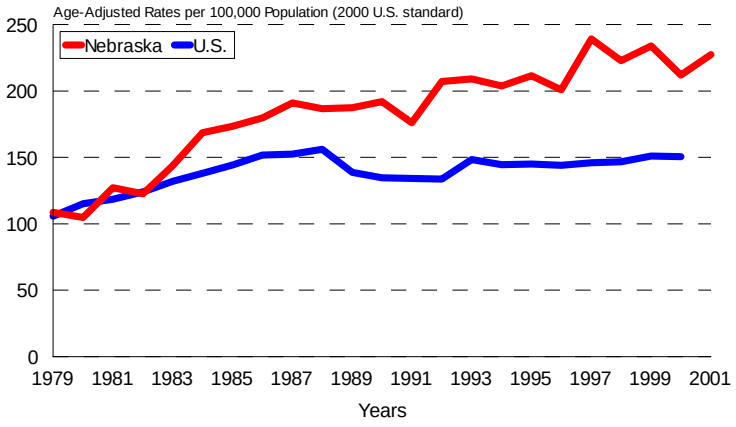
Definition[27]: Heart failure occurs when the heart loses its ability to pump enough blood through the body. Heart failure usually develops slowly, often over years, as the heart gradually loses its pumping ability and works less efficiently.

Codes used to define heart failure: ICD-10 codes I50 and ICD-9 codes 428, comparability ratio 1.0410

Between 2 and 3 million Americans have heart failure, and 400,000 new cases are diagnosed each year[27]. While the mortality rate from coronary heart disease is declining, the mortality rate from heart failure is increasing in both Nebraska and the nation (Figure 22).

Of the 1,819 heart failure deaths that occurred among Nebraska residents between 1999 and 2001, 94.8 percent (or 1,725 deaths) occurred among older adults (residents aged 65 and older). Among older adults in Nebraska, the heart failure mortality rate (age-adjusted) increased by 109 percent between 1979 and 2001 (Figure 22). Furthermore, from 1979 to 2001, the number of heart failure deaths among older adults in Nebraska increased from 211 to 586 respectively for a 177 percent increase.

Figure 22: Nebraska Trends in Heart Failure Mortality Rates* Among Older Adults (aged 65 and older), 1979-2001



*Includes ICD-10 code I50 and ICD-9 code 428, comparability ratio (1.0410) applied to years 1979-1998
Sources: Nebraska Vital Records; CDC Wonder, Mortality Data, <http://wonder.cdc.gov>

When compared to the nation, heart failure mortality rates among older adults in Nebraska are increasing at a much steeper pace (Figure 22). In 2000, older adults in Nebraska were 41 percent more likely than older adults nationally to die from heart failure (based on their age-adjusted mortality rates)[10]. This is a sharp contrast to residents nationally being more likely than residents in Nebraska to die from both coronary heart disease and stroke[10].

In large part, the growing presence of heart failure as a health problem reflects the aging of the U.S. population[27]. Heart failure risk increases with age, and older adults are the fastest growing segment of the population[27]. There are a couple of possible explanations for the dramatic increases in heart failure mortality among older adults in Nebraska, however, further investigation is needed to better understand this trend. First, according to the Framingham Heart Study, increases in obesity are strongly associated with increases in heart failure[28]. Between 1990 and 2001, the percentage of obese older adults in Nebraska increased dramatically, from 11.6 percent to 20.7 percent[3]. Second, the sharp decline in coronary heart disease mortality among older adults in Nebraska may be resulting in more heart failure, since these individuals are subsequently at high risk for heart failure.

Heart failure is largely identifiable and preventable. As a result, access to care, quality of care, public awareness, and interventions to improve heart failure risk factors all present excellent opportunities for slowing Nebraska's death rate from heart failure and controlling unnecessary medical costs.

Stroke

Definition[29]: Stroke is a type of cardiovascular disease. It affects the arteries leading to and within the brain. A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or bursts. When that happens, part of the brain cannot get the blood (and oxygen) it needs, so it starts to die.

Codes used to define stroke: ICD-10 codes I60-I69 and ICD-9 codes 430-434, 436-438, comparability ratio 1.0588

Stroke Highlights

National Highlights

- Accounted for approximately 1 of every 15 deaths in the United States in 2001, killing 163,538 U.S. residents[2].
- About half of all stroke deaths occur out of hospital[2].
- Independently from other CVDs, stroke ranks as the third leading cause of death[30].
- On average, someone dies from a stroke every 3 minutes[2].
- The number of actual deaths from stroke increased 8 percent between 1990 and 2001[30].

Nebraska Highlights

- Stroke killed 1,126 Nebraska residents in 2001.
- Independently from other CVDs, stroke ranks as the third leading cause of death.
- Actual deaths from stroke have remained virtually unchanged from 1989-1993 to 1999-2001.
- The age-adjusted stroke mortality rate declined 32.1 percent between 1979-1983 and 1989-1993, however declined just 10.1 percent between 1989-1993 and 1999-2001.
- Between 1999 and 2001, 1 in every 13 stroke deaths occurred among a Nebraska resident under 65 years of age.
- In 2001, 3 in every 5 stroke deaths in Nebraska occurred among females, however, males were 20 percent more likely than females to die from stroke (based on their age-adjusted mortality rate).
- Between 1999 and 2001, African Americans were 1.5 times more likely than Whites to die from stroke (based on their age-adjusted mortality rate).
- In 2001, Nebraska residents enrolled in Medicaid at their time of death were 4.4 times more likely than Nebraska residents not enrolled in Medicaid at their time of death to die from stroke (based on their age-adjusted mortality rate).

Overall Stroke Mortality

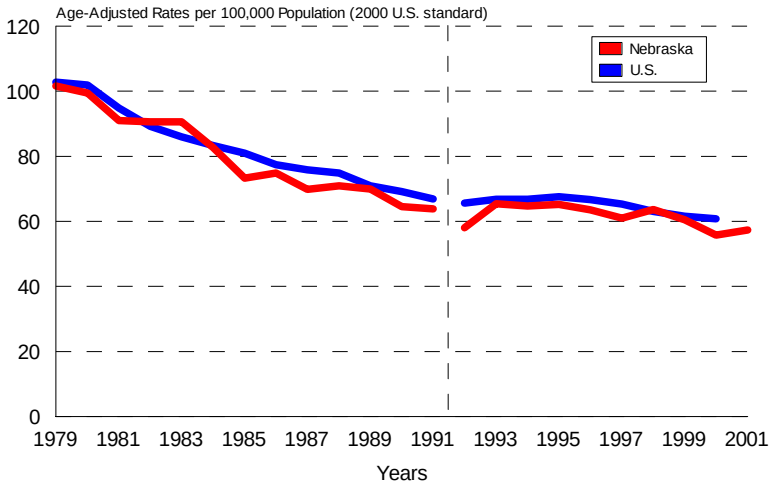
Independently from other forms of CVD, stroke ranks as the third leading killer of Nebraska residents. In 2001, stroke claimed the lives of 1,126 Nebraska residents, of which 107 were under the age of 65. Stroke accounted for approximately 1 in every 13.5 deaths in Nebraska in 2001.

Stroke mortality in both Nebraska and the U.S. declined dramatically from the late 1970s to the early 1990s, before trends began to level off and declines became more moderate (Figure 23). In Nebraska, the age-adjusted stroke mortality rate declined 32.1 percent between 1979-1983 and 1989-1993, however this rate declined just 10.1 percent between 1989-1993 and 1999-2001.

While stroke trends are declining, some research is indicating that the declines are likely resulting from declines in case fatality rather than changes in event rates[7]. These findings strongly support the need for public health efforts to prevent stroke .

Nebraska residents are less likely than U.S. residents to die from stroke. In particular, the relative risk (or rate ratio) for stroke mortality (based on the age-adjusted mortality rate) for Nebraska residents compared to U.S. residents is 0.92[1,10]. In 2000, Nebraska's stroke mortality rate ranked 12th lowest among the 50 U.S. states and District of Columbia (interquartile rate range 55.9-67.4)[10].

Figure 23: Stroke Mortality Trends*, 1979-2001



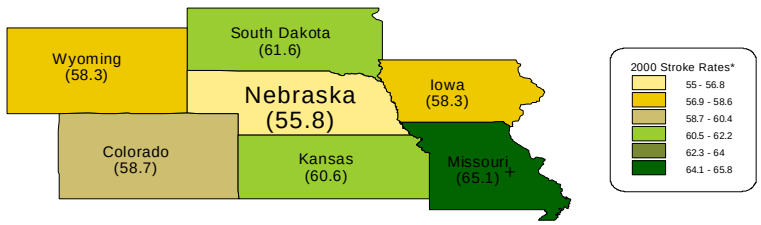
*Includes ICD-10 codes I60-I69 and ICD-9 codes 430-434, 436-438, comparability ratio (1.0588 applied to years 1979-1998)
Sources: Nebraska Vital Records; CDC Wonder, Mortality Data, <http://wonder.cdc.gov>

Since the early 1990s, the average number of stroke deaths per year in Nebraska has remained virtually unchanged. The average number of stroke deaths per year declined 22.3 percent between 1979-1983 and 1989-1993, while the average number of stroke deaths per year declined just 1.8 percent between 1989-1993 and 1999-2001.

While the stroke mortality rate (age-adjusted) in Nebraska appears lower than all bordering states, it is only significantly lower than the rate in Missouri. In 2000, Nebraska residents were significantly less likely than residents of Missouri (relative risk of 0.86) to die from stroke (based on their age-adjusted mortality rates)[1,10].

While stroke mortality rates in Nebraska are lower than some bordering states, the stabilization of the stroke mortality trend (after dramatic declines during the 1980s) and recent increases in stroke risk factors warrant continued prevention and control efforts for stroke in Nebraska. It is important that Nebraska continues to create and implement new and aggressive plans to address stroke in future years.

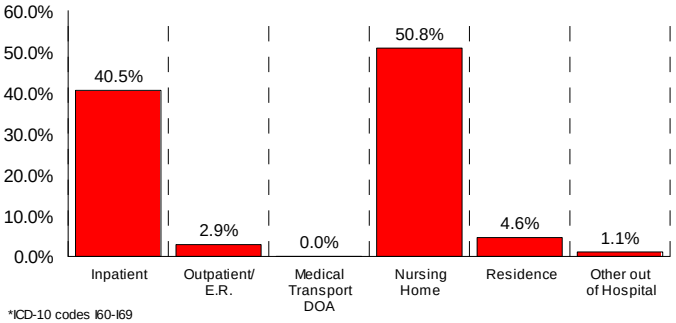
Map 3: Stroke Death Rates* for Nebraska and Bordering States, 2000



*Age-adjusted rate per 100,000 population (2000 U.S. standard) using ICD-10 Codes I00-I69
+Rate is significantly different from the Nebrasak rate at the .01 level
Sources: Nebraska Vital Records; CDC Wonder, Mortality Data, <http://www.wonder.cdc.gov/>

Unfortunately, many stroke deaths in Nebraska occur without medical care (Figure 24). Between 1999 and 2001, 3 in every 5 stroke deaths (59.4%) occurred outside of inpatient care, likely resulting from sudden or near sudden death. Thrombolytic drugs are very effective for saving the lives of stroke victims. However, given the limited window for thrombolytic administration, it is critically important that victims recognize stroke signs and have quality emergency medical services available immediately.

Figure 24: Location of Stroke Death in Nebraska*, 1999-2001



*ICD-10 codes I60-I69
Note: 3 deaths occurred in an unknow n location.
Source: Nebraska Vital Records

Preventable Risk Factors for Stroke

There are a variety of preventable risk factors for stroke morbidity and mortality. While many of these risk factors are highly correlated with one another, each is uniquely important to stroke prevention and should be a primary focus for decreasing stroke in Nebraska. *See chapter 4 for more information on preventable risk factors*

High Blood Pressure - High blood pressure is the most important risk factor for stroke[31]. It usually has no specific symptoms and no early warning signs[31]. About two-thirds of people who have a first stroke have blood pressures higher than 160/95 mm Hg[11].

High Blood Cholesterol[31] - A high level of total cholesterol in the blood (240 mg/dl or higher) is a major risk factor for heart disease, which increases risk for stroke. Recent studies show that high levels of LDL ("bad") cholesterol (>100 mg/dL) and triglycerides (blood fats, ≥ 150 mg/dL) increase the risk of stroke in people with previous coronary heart disease, ischemic stroke or transient ischemic attack (TIA). Low levels ((<40 mg/dL) of HDL ("good") cholesterol also may raise stroke risk.

Lack of Physical Activity[32] - Moderate to high levels of physical activity can reduce the risk of having a stroke (including total, ischemic, or hemorrhagic). Compared with low-active individuals, it is estimated that highly active individuals have a 25 to 64 percent lower risk of stroke incidence or mortality.

Unhealthy Eating - Consuming five servings per day of fruits and vegetables is related to a 30 percent lower risk of ischemic stroke in men and women[33]. Recent research studying stroke risk in Japanese men and women concluded that daily consumption of green-yellow vegetables and fruits is associated with a lower risk of total stroke, intracerebral hemorrhage, and cerebral infarction mortality (with similar benefits among both men and women)[34].

Smoking - The relative risk of stroke in heavy smokers (more than 40 cigarettes a day) is twice that of light smokers (less than 10 cigarettes per day)[35]. Former smokers develop stroke at the same rate as nonsmokers soon after stopping[35]. Stroke risk decreases significantly after two years and is at the level of nonsmokers by five years after cessation of cigarette smoking[35]. Cigarette smoking among women, when combined with some forms of birth control, can greatly increase stroke risk[31].

Obesity - Although limited, some research is indicating that obesity independently increases stroke risk. Obese men (BMI ≥ 30) are twice as likely as men at a healthy weight (BMI ≤23) to have a stroke[36]. Furthermore, abdominal obesity (compared to BMI) has been identified as an independent, potent risk factor for ischemic strokes in all race and ethnic groups[37].

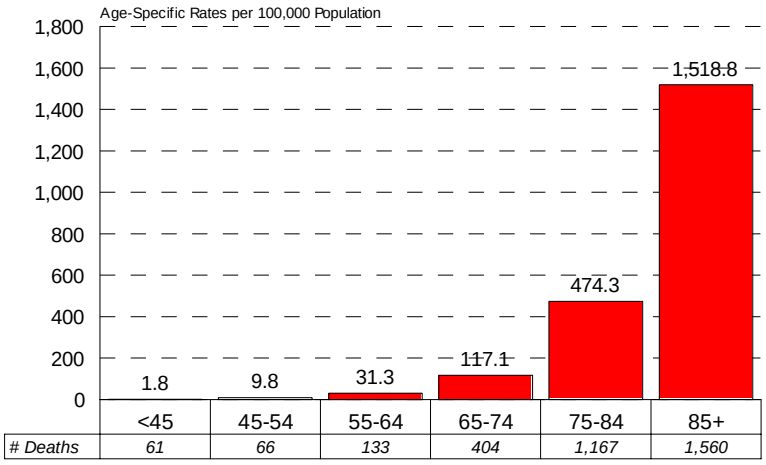
Diabetes - Although diabetes is treatable, simply having diabetes increases a person's risk of stroke[31]. Stroke risk is 2.5 times higher in people with diabetes[38]. Non-fatal strokes among diabetic patients compared to non-diabetic patients are more likely to result in disability from loss of motor function[39].

Excessive Alcohol Consumption - Some studies have shown that while drinking alcohol in moderation may reduce stroke risk, excessive drinking can dramatically increase risk[40]. Drinking an average of more than two drinks per day can increase your risk for stroke by as much as three times (as well as contribute to a wide variety of other health and risk problems)[40].

Stroke Mortality by Age

Risk of death from stroke increases dramatically as age increases, making age the greatest single predictor of stroke mortality for Nebraska residents (Figure 25). Between 1999 and 2001, approximately 4 in every 5 stroke deaths occurred among residents aged 75 and older.

Figure 25: Nebraska Stroke Mortality Rates* by Age, 1999-2001



*Includes ICD-10 Codes I60-I69
Source: Nebraska Vital Records

Although most stroke deaths occur among older adults in Nebraska, stroke claims a large number of lives prematurely (before age 65). Between 1999 and 2001, stroke prematurely killed 260 Nebraska residents (or an average of 87 Nebraska residents per year). This indicates that stroke is responsible for approximately 1 in every 35 premature Nebraska deaths.

The trend in stroke mortality among residents under 45 has not changed in more than 20 years (Table 11). In contrast, stroke mortality rates among middle and older Nebraska adults declined dramatically since the late 1970s. In particular, the rate among middle aged adults (aged 45-64 years) declined 50.3 percent between 1979-1983 and 1999-2001 while the number of actual stroke deaths declined 37.1 percent.

Table 11: Trends in Stroke Mortality* by Age in Nebraska

	<45		45-64		65+	
years	Average # deaths/year	rate**	Average # deaths/year	rate**	Average # deaths/year	rate**
1979-1983	17	1.6	105	36.1	1,357	654.0
1984-1988	20	1.8	84	29.1	1,138	526.2
1989-1993	21	2.0	71	24.5	1,055	470.2
1994-1998	23	2.1	79	24.1	1,099	480.0
1999-2001	20	1.9	66	17.9	1,044	451.8
% change: 79-83 to 99-01	18.5%	15.6%	-37.1%	-50.3%^	-23.1%	-30.9%^

*Codes: ICD-9 codes 430-434, 436-438; ICD-10 codes I60-I69; comparability ratio (1.0588) applied to years 1979-1998
**Age-specific rate per 100,000 population
^1999-2001 rate is significantly lower than the 1979-1983 race at the .001 level
Source: Nebraska Vital Records

Stroke Mortality by Gender

Independently from other forms of CVD, stroke is the third leading killer of both males and females in Nebraska. In 2001, stroke accounted for 1 of every 11.9 deaths among females (or 8.4% of all female deaths) and 1 of every 15.7 deaths among males (or 6.4% of all male deaths).

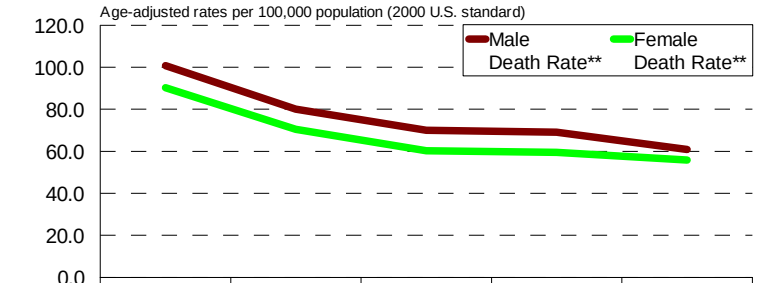
Although stroke death rates are high in Nebraska, males and females in Nebraska compare well to other U.S. states. In 2000, Nebraska males and females each ranked 15th lowest (interquartile rate ranges 55.2-70.8 and 54.3-65.5 respectively) in their rate of stroke mortality (age-adjusted) compared to all other U.S. states and the District of Columbia[10].

Males are more likely than females to die from stroke in Nebraska (Figure 26). Between 1999 and 2001, males were 9 percent more likely than females to die from stroke. Although males remain more likely than females to die from stroke (based on their age-adjusted rate) the gender disparity has declined slightly from that observed during most of the 1980s and 1990s.

In contrast to the mortality rate, more Nebraska females than males died from stroke between 1999 and 2001, 2,107 to 1,284 respectively. While the number of stroke deaths continues to decline among both males and females, current declines are more moderate than those observed 10 to 20 years ago. From 1979-1983 to 1989-1993, declines in the actual number of stroke deaths among males and females were 20.5 and 25.0 percent respectively, compared to declines of 1.3 and 2.7 percent respectively from 1989-1993 to 1999-2001.

Males, compared to females, are at greater risk for stroke mortality between the ages of 65-74 and 75-84 (Figure 27). Gender differences in stroke mortality within all other age categories are non-significant.

Figure 26: Nebraska Stroke Mortality Trends*, 1979-2001



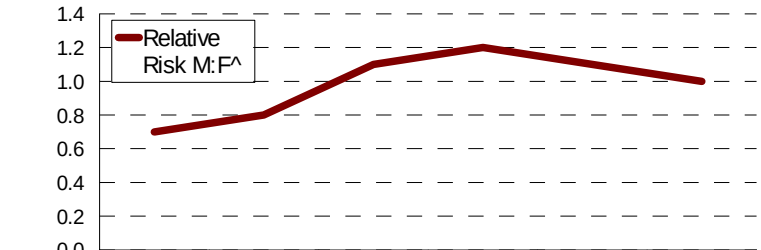
	1979-1983	1984-1988	1989-1993	1994-1998	1999-2001
Male Death Rate**	100.8	80.0	70.0	69.1	60.8^
Female Death Rate**	90.3	70.4	60.2	59.5	55.9^
*Relative Risk M:F***	*1.1*+	*1.1*++	*1.2*++	*1.2*++	*1.1*

Years

*ICD-9 Codes 430-434, 436-438; ICD-10 Codes I60-I69; comparability ratio (1.0588) was applied to data from 1979-1998
**Age-Adjusted Death Rates per 100,000 Population
***Relative risk represents the male to female rate ratio
Source: Nebraska Vital Records

*,+The male rate is significantly higher than the female rate at the .01 or .001 level respectively
^The 1999-2001 rate is signifantly lower than the 1979-1983 rate at the .001 level

Figure 27: Relative Risk for Stroke* Mortality in Nebraska by Gender and Age between 1999 and 2001



	<45	45-54	55-64	65-74	75-84	85+
Male Death Rate**	1.5	8.9	32.4	131.1	511.9	1,546.7
Female Death Rate**	2.1	10.6	30.3	105.4	449.1	1,507.9
*Relative Risk M:F^*	*0.7*	*0.8*	*1.1*	*1.2*+	*1.1*+	*1.0*

Age-Categories

*ICD-10 Codes I60-I69
^Relative risk represents the male to female rate ratio
Source: Nebraska Vital Records

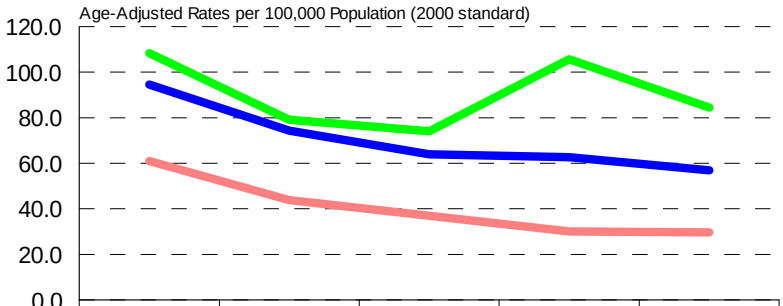
**Age-Specific Death Rates per 100,000 Population
+The male rate is significantly higher than the female rate at the .05 level

Stroke Mortality by Race

Large disparities in stroke mortality exist between different racial and ethnic groups in Nebraska, making race an important non-preventable risk factor for stroke. Among racial and ethnic groups in Nebraska with sufficient data to calculate stroke mortality rates, African Americans are the most likely to die from stroke (Figure 28). Between 1999 and 2001, African Americans were 1.5 times more likely than Whites to die from stroke while Hispanics were less likely than Whites (relative risk of 0.52) to die from stroke (based on their age-adjusted mortality rates).

Compared to other U.S. states, stroke mortality rates (age-adjusted) for Whites and Hispanics in Nebraska rank well while African Americans and Native Americans rank poorly. Between 1991 and 1998, among residents aged 35 years and older, Whites in Nebraska, ranked 19th lowest among all U.S. states and the District of Columbia while Hispanics in Nebraska tied for 9th lowest out of 39 states (with enough deaths for valid comparison)[41]. In contrast, between 1991 and 1998, among residents 35 and older, African Americans in Nebraska, ranked 29th highest out of 42 states while Native Americans in Nebraska ranked 29th highest out of 30 states[41].

Figure 28: Nebraska Stroke Mortaltiy Trends* by Race



	1979-1983	1984-1988	1989-1993	1994-1998	1999-2001
Afr. American	108.4	79.1	74.0	105.7	84.5 +
White	94.6	74.3	64.0	62.7	56.9 ^
Nat. American*	-	-	-	79.6	-
Hispanic**	61.0	43.8	-	30.1	29.7 ++

Year Categories

*Includes ICD-9 codes I60-I69; ICD-10 codes 430-434, 436-438; comparability ratio (1.0588) was applied to data from years 1979-1998
Note: Insufficient data to calculate rates for Asians
-Insufficient data to calculate rate
Source: Nebraska Vital Records

**Hispanics can be of any race
+,++Between 1999-2001, the race/ethnicity rate is significantly different from the white rate at the .01 or .001 level respectively
^The 1999-2001 rate is signifantly lower than the 1979-1983 rate at the .001 level

The greatest racial disparities in stroke mortality occur during the pre-retirement, or most productive, years of life. Between 1999 and 2001, African Americans in Nebraska, aged 45-64 years, were 4.6 times more likely than Whites in Nebraska, aged 45-64 years, to die from stroke (based on their age-specific mortality rates).

The average age at the time of stroke death and years of productive life lost (YPLL) per stroke death vary dramatically between African Americans and Whites in Nebraska. Between 1999 and 2001, African Americans died from stroke, on average, at 68.7 years of age compared to Whites at 82.0 years of age. Furthermore, African Americans lost, on average, 10.0 years of productive life per stroke death compared to 2.2 years among Whites.

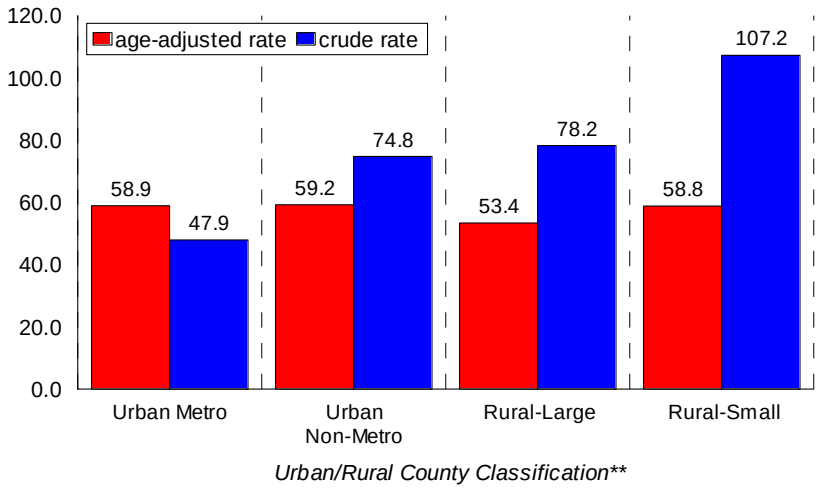
The disparity between African Americans and Whites in Nebraska presents the need for public health interventions specific to the needs within the African American population. Additional studies are needed in Nebraska to identify the causes of disparity in stroke mortality and to help identify successful intervention opportunities.

Stroke Mortality by Geographic Distribution

Between 1999 and 2001, risk for stroke mortality (based on age-adjusted rates) did not differ (statistically) between residents of urban and rural counties in Nebraska (Figure 29). *For further detail on urban/rural categories, see Methodology Section.*

In contrast to the differences observed through age-adjusted mortality rates, crude rates indicate that a larger proportion of Nebraska residents in rural counties, compared to urban counties, die from stroke (primarily due to larger older adult populations within rural counties) (Figure 29). While crude rates are not particularly useful for comparing risk among different populations (since they do not adjust for age differences between populations), they are useful for identifying the rate of actual death that occurs within a population. Knowing this information allows the health care system to be better prepared to deal with life threatening stroke.

Figure 29: Nebraska Stroke Mortality Rates* by Urban/Rural, 1999-2001



*ICD-10 codes I60-I69
**See Methodology Section for further detail on urban/rural county classifications.
Source:Nebraska Vital Records

The average YPLL per stroke death is highest among residents of urban metropolitan counties in Nebraska and declines gradually as county of residence becomes more rural (Table 12). In addition, residents of urban metropolitan counties are, on average, younger at their time of stroke death than residents of other Nebraska counties (Table 12).

Table 12: Stroke* YPLL and Average Age at Deaths in Nebraska by Urban/Rural County Classification, 1999-2001

Urban/Rural Category**	Number of Stroke deaths	Total YPLL for Stroke	Average YPLL per Stroke death	Average age at the time of Stroke death
Nebraska Total	3,391	8,382	2.5	81.6
Urban Metropolitan	1,203	4,204	3.5	79.4
Urban Non-Metropolitan	829	1,726	2.1	82.1
Rural-Large	721	1,340	1.9	82.7
Rural-Small	638	1,113	1.7	83.9

*ICD-10 Codes I60-I69

**See Methodology Section for further detail on urban/rural county classifications

Note: YPLL refers to years of productive life lost, and measures death among persons under 75 years of age *(see methodology for further detail).*

Source: Nebraska Vital Records

Stroke Mortality by Medicaid Enrollment

Medicaid enrollees in Nebraska are much more likely than non-Medicaid enrollees in Nebraska to die from stroke (Table 13). In 2001, 323 Nebraska residents died from stroke while enrolled in Medicaid. This indicates that Medicaid enrollees accounted for greater than 1 in every 4 stroke deaths (28.7%) in 2001 while accounting for just 11 percent of Nebraska's population.

In 2001, Medicaid enrollees in Nebraska were 4.4 times more likely than non-Medicaid enrollees in Nebraska to die from stroke. Aside from differences in age, Medicaid enrollment status has a stronger association with stroke mortality than any other subpopulation presented within this report.

Nebraska's Medicaid population is made up of predominately women and children. As a result, approximately 2 in every 3 Medicaid deaths due to stroke (67.5%) occurred among females in 2001. However, male Medicaid enrollees in Nebraska were 1.5 times more likely than female Medicaid enrollees in Nebraska to die from stroke in 2001 (based on their age-adjusted mortality rates).

It is particularly concerning that some of the most striking disparities in stroke mortality (between Medicaid and non-Medicaid enrollees in Nebraska) occur among adults during their most productive years of life. Medicaid enrollees in Nebraska aged 45-64 years were 9.4 times more likely than non-Medicaid enrollees in Nebraska to die from stroke in 2001.

Table 13: Stroke Mortality*: Medicaid vs Non-Medicaid

	Medicaid Enrollees**			Non-Medicaid Enrollees			Relative Risk^^
	# Deaths	Death Rate^	Population	# Deaths	Death Rate^	Population	Med:Non-Med
Overall	323	202.2	194,055	803	45.8	1,530,373	4.41+
Gender							
Female	218	181.8	112,087	452	41.6	761,677	4.37+
Male	105	275.1	81,968	351	52.7	768,696	5.22+
Race							
Asian	1	-	2,235	4	-	23,735	-
Native American	2	-	6,900	1	-	9,145	-
African American	20	233.2	26,535	18	-	44,361	-
Hispanic	16	-	21,742	21	-	77,249	-
White	300	210.1	133,358	780	45.0	1,445,929	4.67+
Age							
<25	0	-	134,607	1	-	493,932	-
25-44	9	-	28,207	17	3.7	458,948	-
45-64	20	155.7	12,845	60	16.5	362,770	9.41+
65+	294	1,598.2	18,396	725	337.6	214,724	4.73+

*ICD-10 Codes I60-I69

**Medicaid deaths consist of Nebraska residents enrolled in Medicaid at their time of death. Medicaid population data represents enrollment eligibility years for 2001 (or the # of enrollees if everyone enrolled was enrolled for an entire year).

^Age-adjusted rate per 100,000 pop (2000 U.S. standard population) (Note: rates for age categories are age-specific)

^^Relative Risk represents the Medicaid to non-Medicaid rate ratio

+Medicaid rate is significantly higher than the non-Medicaid rate at the .001 level

- Insufficient data to calculate statistic

Source: Nebraska Vital Records

High Blood Pressure

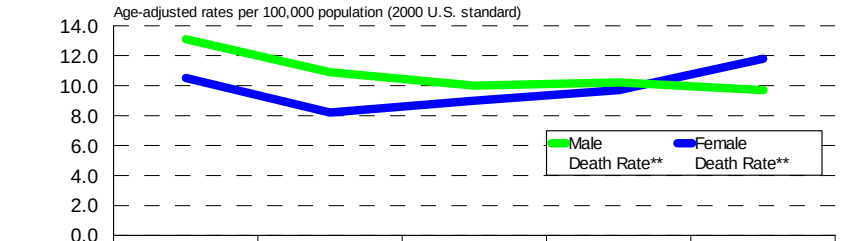
Definition[2]: Systolic pressure of 140 mm Hg or higher or diastolic pressure of 90 mm Hg or higher, or taking antihypertensive medicine

Codes used to define high blood pressure: ICD-10 codes I10-I15 and ICD-9 codes 401-404

Unlike the declines observed in many other forms of CVD, mortality from high blood pressure (HBP) is increasing. Nationally, between 1990 and 2000, the age-adjusted death rate from HBP increased 21.3 percent while the actual number of deaths increased 49.1 percent[2].

Nebraska's HBP mortality rate is increasing. Between 1984-1988 and 1999-2001 the Nebraska age-adjusted mortality rate from HBP increased 22 percent, from 9.3 to 11.3 deaths per 100,000 population respectively (Figure 30). Furthermore, the average actual number of deaths per year from HBP increased 44 percent from 1984-1988 to 1999-2001, 155 to 223 average deaths per year respectively.

Figure 30: Nebraska High Blood Pressure Mortality Trends*, 1979-2001



	1979-1983	1984-1988	1989-1993	1994-1998	1999-2001
Overall Death Rate**	11.6	9.3	9.6	10.2	11.3
Male Death Rate**	13.1	10.9	10.0	10.2	9.7
Female Death Rate**	10.5	8.2	9.0	9.7	11.8
*Relative Risk M:F^*	*1.3*$^{+}$	*1.3*$^{++}$	*1.1*	*1.1*	*0.8*

Years

*ICD-9 Codes 401-404; ICD-10 Codes I10-I15;
no comparability ratio was applied to data from 1979-1998
^Relative risk represents the male to female rate ratio
Source: Nebraska Vital Records

**Age-Adjusted Death Rates per 100,000 Population
$^{+,++}$The male rate is significantly higher than the female at the .05 or .01 level respectively

Although Nebraska's age-adjusted mortality rate from HBP is increasing, Nebraska does compare well to the nation in HBP mortality. Between 1999 and 2000, U.S. residents were 1.5 more likely than Nebraska residents to die from HBP (based on their age-adjusted mortality rates)[1,10]. Furthermore, among all 50 U.S. states and the District of Columbia, Nebraska's age-adjusted mortality rate from HBP ranked 11th lowest (interquartile rate range 11.0 to 17.0) between 1999 and 2000[10].

Since the mid 1980s, HBP mortality rates in Nebraska increased among females but decreased among males. Between 1984-1988 and 1999-2001, the age-adjusted mortality rate from HBP increased 44 percent among females while remained statistically unchanged among males.

Dramatic differences in HBP mortality exist between African Americans and Whites in Nebraska. Between 1999 and 2001, African Americans were 3.6 times more likely than Whites to die from HBP (based on their age-adjusted mortality rates). These dramatic differences may be due in large part to the higher prevalence of HBP among Nebraska's African American residents (see Chapter 4 for further detail). Nationally, African Americans, compared to Whites, develop HBP earlier in life and their average blood pressures are much higher[42].